Biological Evaluation

For

Terrestrial and Aquatic Wildlife

Sunny South Insect Treatment Project

American River Ranger District
Tahoe National Forest

June 30, 2016

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and

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I. EXECUTIVE SUMMARY

DATE: June 30, 2016

PROJECT NAME: **SUNNY SOUTH INSECT TREATMENT PROJECT**

SCOPE OF AREA AFFECTED: The project is located on the American River Ranger District, Tahoe National Forest, near Sugar Pine Reservoir, Big Oak Flat, and the Foresthill Forest Genetics Center in Placer County, California (Figure 1). The total project area is approximately 2,800 acres. The elevations rangers from 3,000 to 4,500 feet above mean sea level.

- BRIEF DESCRIPTION OF PROJECT: The Tahoe National Forest, American River Ranger District proposed the Sunny South Insect Treatment Project (hereafter Sunny South Project) to accomplish the following: 1) Reduce the risk or extent of, or increase resilience to, insect infestation; 2) Reduce wildfire risk to the local communities and surrounding federal lands associated with insect infestation-caused tree mortality; and 3)Improve forest heterogeneity in mortality-created openings with a mixture of trees more resistant to bark beetle outbreaks.

PROJECT ANALYSIS: Effects analyses differ spatially by species, as described below, and extend 20 years before and after the present; in correlation with the estimated longevity of the vegetation treatments. The findings of this biological evaluation (BE) for terrestrial and aquatic wildlife for the Sunny South Project are summarized below (Table 1).

Table 1. Summary of R5 Sensitive Species analyzed in this Biological Evaluation.

SPECIES	PRESENCE OR SUITABLE HABITAT	EFFECTS DETERMINATION[1]	REASON FOR NO EFFECT, IF APPLICABLE
Terrestrial Species			
Western bumblebee	Y	May affect NLRT	
Bald eagle	Y	May affect NLRT	
California spotted owl	Y	May affect NLRT	
Great gray owl	Y	May affect NLRT	
Northern goshawk	Y	May affect NLRT	
Willow flycatcher	N	No effect	No suitable habitat
Greater sandhill crane	N	No effect	No suitable habitat
Fisher	N	No effect	Outside current range
Pacific marten	Y	May affect NLRT	
California wolverine	N	No effect	No suitable habitat
Pallid bat	Y	May affect NLRT	
Townsend's big-eared bat	Y	May affect NLRT	
Fringed myotis	Y	May affect NLRT	
Aquatic Species			
Western pond turtle	Y	May affect NLRT	
Foothill yellow-legged frog	Y	May affect NLRT	
Great Basin rams-horn snail	N	No effect	No suitable habitat
Lahontan Lake tui chub	N	No effect	Outside current range
Hardhead	N	No effect	Outside current range
California floater	N	No effect	No suitable habitat
Black juga	Y	May affect NLRT	

[1] Effects determinations for sensitive species of "may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability" is shown as NLRT.

II. INTRODUCTION

The purpose of this Biological Evaluation (BE) is to document analysis of the potential effects and determine whether the Sunny South Project would result in a trend toward listing or loss of viability for sensitive species. This document provides background information about terrestrial wildlife species and project-related effects. In preparing this analysis, a conscientious attempt was made to review and draw from the best available science regarding species, their associated habitat needs, and the potential for adverse project-related effects.

This BE documents project effects to Pacific Southwest Region (Region 5) Sensitive Species list, updated September 9, 2013, and is prepared in accordance with standards established in Forest Service Manual direction (FSM 2672.42). Forest Service Sensitive species are designated by the Regional Forester and are species that have known or suspected viability problems due to (1) significant current or predicted downward trends in population numbers or density, and/or (2) significant current or predicted downward trends in habitat quantity or quality for these species. The Forest Service considers the long-term conservation needs of sensitive species in order to avoid future population declines and the need for federal listing.

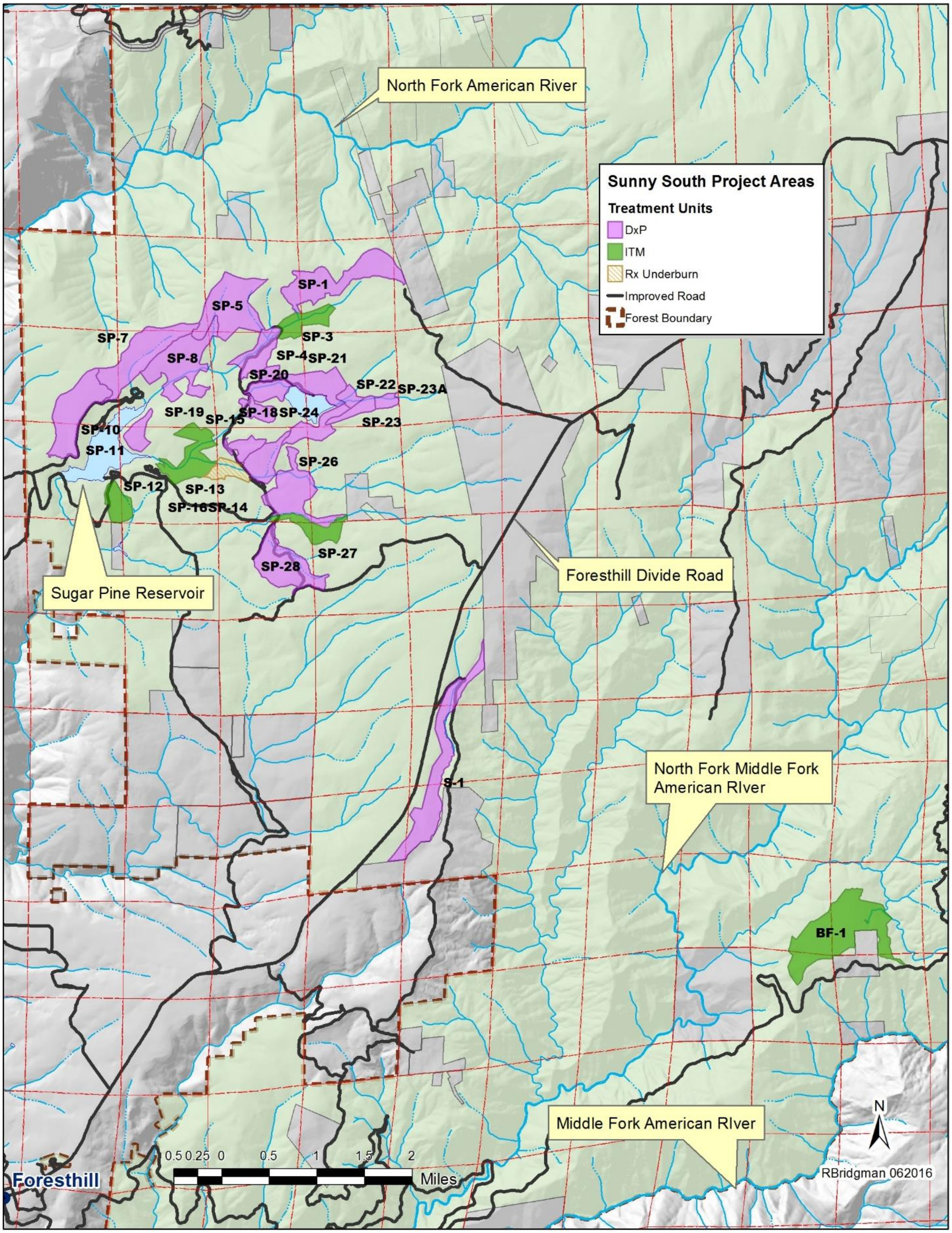
No effects will result from the Sunny South Project to species that do not have suitable habitat in the treatment units or whose current ranges do not overlap the treatment units. Occupancy of any particular species is assumed unless potential habitat does not exist, the area has been surveyed to protocol and found to be absent of the species, or the most recent scientific data indicates that the species does not and will not occur in the geographic area within the foreseeable future. The following species will not be affected and are not analyzed further (rationale for "No Effect" determination given in parentheses). If a more-detailed analysis was conducted to determine whether suitable habitat exists in the analysis area for any particular species, that discussion is included in the species-specific effects analysis.

- Greater sandhill crane (*Grus canadensis tabida)* (no suitable habitat).
- Willow flycatcher (*Empidonax traillii*) (no suitable habitat)
- Fisher (*Pekania pennanti*) (outside current range) – The Tahoe National Forest is within a 400-mile gap in the fisher's historic range (Tucker et al. 2012). The nearest known fisher occurrence is located approximately 80 miles north of the American River Ranger District and consists of a small, recently transplanted population.
- California wolverine (*Gulo gulo luteus*) (no suitable habitat)
- Lahontan Lake tui chub (*Gila bicolor pectinifer*) (outside current range)
- Hardhead (*Mylopharodon conocephalus*) (outside current range)
- California floater (*Anodonta californiensis*) (no suitable habitat)
- Great Basin rams-horn snail (*Helisoma newberryi newberryi*) (no suitable habitat)

Because no effects to the above species or their habitats will result from the project, the following are my determinations:

It is my determination that the Sunny South Project **will not affect** the greater sandhill crane, willow flycatcher, Pacific fisher, California wolverine, Lahontan Lake tui chub, hardhead, California floater, or Great Basin rams-horn snail.

Figure 1. Sunny South Insect Treatment Project



A separate Biological Assessment (BA) was prepared to address project-related effects to federally-listed wildlife species potentially occurring on the Tahoe National Forest. The BA for the project addresses project effects to Threatened, Endangered, and Proposed species and their designated or proposed critical habitat. Effects to the following species are addressed in the BA:

Animals:

- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)
- California red-legged frog (*Rana draytonii*)
- Sierra Nevada yellow-legged frog (*Rana sierrae*)
- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)
- Delta smelt (*Hypomesus transpacificu*s)
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*)
- Winter-run chinook salmon, Sacramento River (*Oncorhynchus tshawytscha*)

III. CURRENT MANAGEMENT DIRECTION

Current management direction on desired future conditions for sensitive species on the Tahoe National Forest can be found in the following documents, filed at the District Office:

- Forest Service Manual and Handbooks (FSM/FSH 2670)
- National Forest Management Act (NFMA)
- National Environmental Policy Act (NEPA)
- The Tahoe National Forest Land and Resource Management Plan (Forest Plan; 1990) was amended in 2001 by the Sierra Nevada Forest Plan Amendment (SNFPA 2001; USDA Forest Service 2001), which was further amended by the 2004 Supplemental Sierra Nevada Forest Plan Amendment (SNFPA 2004; USDA Forest Service 2004). Detailed information including specific standards and guidelines for species management can be found in these documents.
- Species management plans
- Species management guides or conservation strategies
- Regional Forester policy and management direction

General Forest Service direction for Sensitive species from the Forest Service Manual Section 2670 is summarized below:

- Assist States in achieving their goals for conservation of endemic species.
- As part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species.
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
- Establish management objectives in cooperation with the States when a project on National Forest System lands may have a significant effect on sensitive species population numbers or distribution. Establish objectives for Federal candidate species, in cooperation with the USFWS and the States.

Region 5 of the Forest Service released Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands in August 2015 as part of a lawsuit settlement (USFS 2015). The interim recommendations require the development of an alternative that includes the interim guidelines for “any environmental impact statement [EIS] or environmental assessment [EA] prepared for a site-specific, vegetation management project”, which provides larger protected habitat areas based on concentric circles of suitable habitat around Activity Centers than afforded by the current management of Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs). This includes managing 700 acres of suitable habitat; 400 acres of habitat containing 70% canopy cover or more and 300 acres of habitat containing 50% canopy cover or more, all on Forest Service lands. There are five CSO territories with proposed The interim recommendations also recommend retaining PACs affected by fire, while augmenting the area with unburned forested areas nearby where possible. These recommendations are interim because a team is developing a Conservation Assessment of the current state of the science of California spotted owls to update the Assessment published in 1992 (Verner et al) and a Conservation Strategy recommending long-term management direction.

The Sunny South project is located in watersheds identified by the Chief of the Forest Service on November 24, 2015 as part of an insect and disease treatment program in accordance with Title VI, Section 602, of the Healthy Forest Restoration Act (HFRA), as amended by Section 8204 of the Agriculture Act (Farm Bill) of 2014. As such, this project is Categorically Excluded from NEPA analysis and thus does not fall under the spotted owl interim recommendations.

IV. DESCRIPTION OF THE PROJECT

Proposed Action

The proposed action includes about 2,700 acres of treatments including: thinning of at-risk stands, mastication, prescribed burning, soil decompaction of non-system routes, commercial removal of dead and dying trees, and reforestation on NFS lands. The project includes two main project areas consisting of Sugar Pine Reservoir and Big Oak Flat.

Table 2. Summary of proposed vegetation and fuels management activities

Treatment	Acres
Ground-based thinning and follow-up fuels treatment units	2,416
Cable thinning and follow-up fuels treatment units	239
No harvest units have fuels treatments only	43
Total Acres	***2,700***

Reduce Stand Density and Remove Insect-Killed Trees

Forest stands would generally be thinned from below. Live trees greater than 10 inches diameter at breast height (dbh) and up to 30 inches dbh would be considered for commercial thinning. A target stand density index (SDI) is below 230, with residual basal areas ranging from 80 to 125 square feet per acre in the plantations and 120 to 200 square feet per acre in the mixed conifer units. On a treatment area average, thinning treatments will retain at least 40 percent canopy cover in mature forest habitat and at least 50 percent canopy cover in mature forest habitat in California spotted owl Home Range Core Areas (HRCAs). No trees are identified for removal in the spotted owl or northern goshawk Protected Activity Centers (PACs).

Dead and dying beetle-infested trees would be felled and removed; these occur in a variety of patch sizes throughout the treatment areas. Patch sizes range from small patches of three to five trees to areas as large as 15 acres. Removing these trees will create gaps that will be reforested with a mixture of conifer species to increase the species diversity in the treated stands, improving their resilience to future insect and disease infestations.

Thinning would remove competing conifers within 10 feet of hardwood tree driplines to reduce competition. In some instances conifer would be removed from around individual hardwoods, while in other sites conifers would be thinned from around entire clumps of small patches of oaks. The focus of thinning would be on full-crowned, healthy hardwoods that are surrounded by small-diameter conifers.

The largest trees, with live crown ratios greater than 40 percent and free of damage and disease would generally be retained throughout the treatment areas. In the natural stands, retention would be in order of sugar pine, ponderosa pine, Douglas-fir, and incense cedar over white fir. In single-species dominated stands, the least represented species would be retained over the more predominate species to promote species diversity. Smaller trees would be thinned from around large, full-crowned conifers to provide additional growing space, to create conditions for rapid diameter growth, and to help ensure the survival of these relatively uncommon trees.

Unmerchantable dead and dying trees would be felled and piled to create gaps throughout the treatment areas. Thin green trees within one tree length from the edges of these pockets to remove trees that are likely infested with beetles. Snags and large woody debris within each unit would be retained to meet management requirements for soils and wildlife.

When cutting trees in recreation areas, all conifer stumps greater than 3 inches in diameter will be treated with a registered borate compound to reduce the probability of infection by *Heterobasidion* root disease (formerly referred to as annosus root disease). In all other areas, treat conifer stumps greater than 14 inches in diameter.

Conduct whole-tree, ground-based yarding would occur on approximately 2,455 acres. To control erosion and soil disturbance, downhill tractor activity will be limited to less than 35% slopes and uphill on less than 25% unless the leading end is suspended. Whole-tree cable-yarding would occur on 239 acres on slopes generally greater than 30%. Logs would be bunched in cable units with a feller-buncher prior to yarding to the landing. Cut material greater than four inches in diameter would be brought to the landing, with the exception of broken portions of logs and tops less than eight feet in length. Figure 1 shows the unit locations near Sugar Pine Reservoir, the Seed Orchard, and Big Oak Flat.

Riparian Conservation Areas (RCAs): In consultation with the West Zone Hydrologist and Fisheries Biologist, limited vegetation and fuels reduction treatments, including mechanical treatments, are proposed within the RCAs on a site-specific basis. This would occur where:

- topography or existing infrastructure allows equipment to enter without creating un-mitigatable disturbance;
- site-specific mitigations described in the Management Requirements section of this document would ensure these activities would not have adverse effects to watershed function and would be completed at the time of implementation; and
- treatments are consistent with the Forest Plan standards and guidelines and riparian conservation objectives (RCO's) described in the 2004 SNFPA ROD.

Archaeology site treatments: In consultation with the Archaeologist, treat approximately 2 acres in archaeology sites in units SP-8 and BF-1 to reduce the fuels build-up on-site. Hand cut small trees up to 6 inches dbh. Hand carry cut material or toss it past the flag line, scattering it for future burning.

Hazard Trees: Fall and leave on site or fall and remove trees posing an imminent hazard to vegetation and fuels management operations as well as public safety along NFS roads and trails within the treatment unit boundaries. Limit hazard tree treatments (either falling and leaving or falling and removing hazard trees) to trees that could impact the road and threaten public safety if they failed (generally within 200 feet of the road), and utilize the Forest Service Pacific Southwest Region's Hazard Tree Marking Guidelines to identify hazard trees. Fall identified hazard trees and leave in place or remove if commercially viable by yarding felled trees and/or endlining to the road. Limit ground-based equipment to slopes less than 30% for hazard tree removal operations.

Rust Resistant Sugar Pine Trees: Two rust resistant sugar pines (RRSP) are located within units SP-1 and SP-28. These trees are important because they were identified as seed trees that are immune to sugar pine rust, which has killed many trees. The RRSP protection strategy would further reduce stand density immediately surrounding the RRSP to promote the health of the individual trees and any adjacent conifers greater than 30 inches dbh, increasing the resilience of these trees to insects and disease. All trees less than 30 inches dbh within 25 feet of the drip line. In addition, the treatments for these RRSPs would reduce surface and ladder fuels that create hazardous conditions for tree survival during wildfires. The range of treatments may include fireline construction, shrub cutting, piling of slash and brush, pile burning, chipping, and removal of trees from sapling size up to 30 inches dbh, using ground-based equipment. Surrounding tree density would be reduced within 150 to 300 feet of the RRSP (between approximately 1.6 to 6.5 acres of vegetation treatments). Heavy duff and litter accumulations within two to three feet of the base of each tree would be raked away.

Table 3. Units with acres, basal area, canopy closure and fuels treatments

Unit	Plantation or Mixed Conifer	Acres	HRCA[1]	Target Canopy Closure (%)	Expected Basal Area	Harvest and Fuels Treatments
BF-1	Mixed Conifer	314.9	Y	50	120	WTY[2], underburn
S-1	Plantation	219.2	N	40	100	Bunch WTY, underburn
SP-1	Plantation	194.7	N	40	100	WTY, underburn
SP-3	Mixed Conifer	65.3	N	40	100	WTY, underburn
SP-4	Plantation	79.0	Y	50	120	WTY, underburn
SP-5	Plantation	196.6	Y	50	120	WTY, underburn
SP-7	Plantation	181.6	Y	50	120	WTY, underburn
SP-8	Plantation	186.8	Y	50	120	WTY, underburn
SP-10	Plantation	176.2	Y	50	120	WTY, underburn
SP-11	Plantation	41.1	Y	50	120	WTY, grapple pile and burn, or jackpot pile and underburn
SP-12	Mixed Conifer	55	Y	50	160	WTY, underburn
SP-13	Mixed Conifer	118.3	Y(Partial)	50/ 40	100	WTY, masticate, underburn
SP-14	Mixed Conifer	43.4	N	NH	NH	Underburn
SP-15	Plantation	75.2	Y	50	120	WTY, underburn
SP-16	Plantation	39.1	Y	50	120	WTY, underburn
SP-18	Plantation	36.6	Y	50	120	WTY, underburn
SP-19	Plantation	50.8	Y	50	120	WTY, underburn
SP-20	Mixed Conifer /Plantation	20.5	Y	50	100	WTY, underburn
SP-21	Plantation	91.6	N	40	100	WTY, underburn
SP-22	Plantation	22.6	N	40	100	WTY, underburn
SP-23	Plantation	32.1	N	40	100	WTY, underburn
SP-23A	Plantation	20.3	N	40	100	WTY, underburn
SP-24	Plantation	65.3	N	40	100	WTY, underburn
SP-26	Plantation	151.9	N	40	100	WTY, underburn
SP-27	Mixed Conifer	64.3	N	40	160	WTY, underburn
SP-28	Plantation	156.9	N	40	100	WTY, underburn
Total		***2,700***				

[1]HRCA=Home Range Core Area; WTY = Whole tree yard

Fuels Treatments

In the harvest units, treat the non-commercial trees (4 to 9.9 inches dbh) by whole-tree yarding to the landing, pile and burn, or chip and remove the material as biomass. Bunch the material in cable units with a feller-buncher prior to yarding to the landing. Following the whole-tree yarding, evaluate these units for follow-up surface and activity fuel treatments. Treat fuels in the area with prescribed burning, such as underburning or hand pile and burn the piles. Grapple pile (using tracked-based equipment) and burn surface fuels on up to 25% of the harvested units prior to underburning, based on economic feasibility and existing surface fuel conditions. Pile and burn up to 25% of the harvested units emphasizing areas with pockets of dead or unmerchantable material. Piles may be burned under conditions where the fires could be allowed to spread and effectively underburn portions of the stand concurrently. Trees greater than 40 inches dbh and/or trees with previous fire ("cat-face") scars may have duff and vegetation cleared away from their boles in order to provide additional protection during prescribed burning. A site and condition-specific prescribed fire plan would be completed prior to burning. Mechanically masticate brush and non-commercial trees in SP-13 and follow up with an underburn when the trees are able to withstand ground fire.

Unit SP-14 would not be harvested and no mechanical treatments are planned. Prescribed fire, mainly consisting of underburning, would be applied on 43 acres to reduce fuels and increase resilience to drought and insect infestation. Hand pile and burn if needed.

Soil Decompaction

Subsoil or rip compacted soil on approximately 9 miles (13 acres) of existing unauthorized routes, landings, main skid trails and temporary roads with equipment such as a winged sub-soiler or other tilling device to a depth of 12 to 18 inches. Break up the compaction and incorporate organic matter into the upper few inches of the soil column to allow rain and snowmelt to infiltrate the soil and get stored in the organic matter. Install drainage features, such as waterbars, as needed to prevent concentrated flows from causing erosion. Complete tillage/sub-soiling outside of the tree drip line so as not to impact root systems. Block off by placing cull log in front of road and cover log with soil.

Reforestation

In areas of concentrated mortality, reforest using a combination of site preparation, plant and release treatments. Site preparation would include tilling the top soil, as needed, to remove brush and other competing vegetation to facilitate the planting effort. Up to 10 percent of the planted areas may need tilling where 20 percent or more of the reforestation area is covered by brush. Plant a variety of tree species: Douglas-fir, incense cedar, ponderosa pine, and sugar pine. Release for survival by manually grubbing a 5-foot radius around the planted trees until they are established above the competing vegetation. Reforestation efforts are planned for approximately 600 acres within the project area, although the number of acres needing reforestation could rise if tree mortality increases prior to implementation.

V. MANAGEMENT REQUIREMENTS

Management requirements are designed to ensure compliance with current management direction and to reduce or prevent adverse effects of proposed actions to wildlife species. The management requirements shown below are incorporated into the proposed action and are discussed on a species specific basis in the effects analysis. The project includes additional measures to protect other resources that may affect wildlife, including measures for sensitive plants and to prevent the spread of noxious weeds, but listed here are those particularly relevant to wildlife.

Terrestrial Wildlife

1. Retain riparian vegetation and hardwoods, such as oaks, madrone, alder, willow, and cottonwood. Some riparian and hardwood vegetation may be removed for operability or safety. Reduce competing conifer trees under 30 inches dbh, where possible. Where possible, create openings around hardwoods to stimulate natural regeneration.
2. Where feasible and where it occurs in a stand, retain uncommon shrub species such as elderberry, redberry, coffeeberry, dogwood, and Sierra plum. Retain common shrub species in patches where it would not compromise fuels management goals.
3. Retain four of the largest snags per acre larger than 15 inches dbh following Forest Plan management direction. Snag numbers can be averaged over 10 acres.
4. Implementation of stand thinning, mastication, piling, burning, or road maintenance will not occur in suitable habitat for spotted owls or northern goshawks with unknown occupancy until protocol surveys are completed. If spotted owls or northern goshawks are detected outside of designated PACs, protected territories would be established and managed according to the Forest Plan.
5. If federally-listed or sensitive species are detected in or within 0.5-mile of the project area prior to or during project activities, the District Wildlife Biologist will be notified and an appropriate LOP or other protective actions will be applied, as needed.
6. **Sensitive Species PAC, HRCA, and Canopy Cover Retention**
   a. No mechanical removal of trees over 6 inches dbh would occur in spotted owl or northern goshawk PACs. Do not locate log processing landings for timber operations in northern goshawk or spotted owl PACs.
   b. Within spotted owl home range core areas (HRCAs), where existing vegetative conditions permit, retain at least 50 percent canopy cover averaged within the treatment unit. Exceptions are allowed in limited situations where additional trees must be removed to adequately reduce ladder fuels, provide sufficient spacing for equipment operations, or minimize re-entry. Where 50 percent canopy cover retention cannot be met for reasons described above, retain at least 40 percent canopy cover averaged within the treatment unit. This applies to all or part of the following units: SP4-13, SP15-20, and BF-1
   c. For all mechanical thinning treatments, design projects to retain all live conifers 30 inches dbh or larger. Exceptions are allowed to meet needs for equipment operability or safety.
   d. For mechanical thinning treatments in mature forest habitat (defined as CWHR types 4M, 4D, 5M, 5D, and 6) outside Wildland Urban Interface (WUI) Defense Zones
      - Retain at least 40 percent of the existing basal area. The retained basal area should generally be comprised of the largest trees.
      - Where available, retain 5 percent or more of the total treatment area in lower layers composed of trees 6 to 24 inches dbh within the treatment unit.
      - Avoid reducing pre-existing canopy cover by more than 30 percent within the treatment unit. Percent is measured in absolute terms (for example, canopy cover at 80 percent should not be reduced below 50 percent.)
      - Where existing vegetative conditions are at or near 40 percent canopy cover, remove the material necessary to meet fire and fuels objectives.

7. **Limited Operating Periods for Wildlife**

    a. Maintain a yearly limited operating period (LOP) within 0.25-mile around known osprey nests during the breeding season (March 1 to August 31) unless surveys confirm they are not nesting. Prohibited activities include mechanical thinning, piling and/or burning, and road maintenance. Retain existing trees over 12 inches dbh within 200 feet of nest tree. If nest tree poses a hazard to roads or facilities, retain until after birds have left for the season. Bald eagles are not known to occur near Sugar Pine or Big Reservoirs, but if they nest prior to project implementation a 0.5-mile buffer would be subject to a LOP from January 1 to August 31.
    b. In California spotted owl Protected Activity Centers (PACs), an LOP from March 1st to August 15th will be maintained annually prohibiting mechanical activities such as thinning, piling and/or burning, and road maintenance within approximately 0.25-mile of the activity center unless surveys confirm that California spotted owls are not nesting.
    c. In northern goshawk PACs, an LOP from February 15th to September 15th will be maintained annually prohibiting mechanical activities such as thinning, piling and/or burning, and road maintenance within approximately 0.25-mile of the nest site unless surveys confirm that northern goshawks are not nesting.
    d. If federally-listed or sensitive species are detected in or within 0.5-mile of the project area prior to or during project activities, the District Wildlife Biologist will be notified and an appropriate LOP or other protective actions will be applied, as needed.

Water and Aquatic Resources

1. **Riparian Conservation Areas**

    a. Establish Riparian Conservation Areas (RCAs) for all aquatic features, as specified below. Ensure Riparian Conservation Objectives (RCOs) are met within RCAs by adhering to the Project Riparian Conservation Area (RCA) Guidelines. These guidelines specify the types of activities that can be conducted within RCAs and mitigation measures to minimize impacts to aquatic feature and riparian ecosystems. RCA widths are shown in Table 4.

Table 4. Riparian Conservation Area Widths

Stream Type	Width of the Riparian Conservation Area
Perennial Streams	300 feet each side, measured from bank-full edge
Seasonal Flowing Streams	150 feet each side, measured from bank-full edge
Streams In Inner Gorge	Top of inner gorge
Meadows, lakes, and springs	300 feet from edge of feature or riparian vegetation, whichever is greater

    b. Establish a 100-foot “riparian buffer” zone along each side of perennial streams and special aquatic features, 50-foot “riparian buffer” along each side of intermittent streams and establish a 25-foot “riparian buffer” zone along each side of ephemeral streams. No harvest or ground based equipment is allowed in riparian buffers unless agreed to by a riparian specialist.
    c. Limit ground-based equipment to slopes less than 20% within all RCAs. To reduce ground disturbance created by equipment within RCAs, vary the routes the equipment uses and minimize turning of equipment.
    d. Within RCAs having slopes less than 20%, and outside of the riparian buffer, rubber-tired skidders or low ground pressure equipment may enter to retrieve logs but are limited to 1 to 2

passes over the same piece of ground. Note: Document on harvest cards if entering RCAs with high-ground-pressure equipment to retrieve logs.

e. No new landings or roads will be located within RCAs. Consult with a riparian specialist before using an existing skid trail, landing, or road located within an RCA.
f. Designated skid trails crossing ephemeral stream channels may be approved for access to otherwise inaccessible areas, but only upon consultation with a riparian specialist.
g. Place rock on roads at stream crossings and segments within identified RCAs to reduce the impact of sediment delivery to associated stream courses. Place rock, slash, or certified NNIP free mulch at the outlets of rolling dips and/or waterbars to dissipate water where identified by road engineer and soil scientist, and/or hydrologist.

2. **Water Source Use**

   a. Armor road approaches as necessary from the end of the approach nearest a stream for a minimum of 50 feet, or to the nearest drainage structure.
   b. Where overflow runoff from water trucks or storage tanks may enter the stream, effective erosion control devices shall be installed.
   c. All water-drafting vehicles shall be checked daily and shall be repaired as necessary to prevent leaks of petroleum products from entering RCAs or water.
   d. The operators of water-drafting vehicles shall have petroleum spill kits and know how to effectively deploy the hazardous response materials/spill kits. Dispose of absorbent pads according to the Hazardous Response Plan.
   e. Survey all proposed drafting locations for sensitive and listed amphibians and receives approval from a biologist prior to use. Use drafting devices with 2-mm or less screening and place hose intake into bucket in the deepest part of the pool. Use a low velocity water pump and do not pump ponds to low levels beyond which they cannot recover quickly (approximately one hour). If a sensitive or listed amphibian is sighted within the project area, cease operations in the sighting area, and inform a Forest Service aquatic biologist of the sighting immediately.
   f. Document each load of water drafted from the Sugar Pine Reservoir in terms of gallons per project per truck per day and provide a written report to the Public Services Officer every two weeks.
   g. Any spill into the water shall be immediately contained and reported to the Forest Service dispatch.
   h. Leave one lane of travel at the Sugar Pine Boat Ramp open for recreation use during drafting.

   h. No water drafting from Big Reservoir without owner’s written permission.

3. **Prescribed Fire Activities**

   a. To minimize the spread of fire into riparian vegetation during prescribed fire activities, no direct ignition will occur within riparian buffers, unless otherwise agreed by the Hydrologist, Botanist, or Aquatic Biologist. Fire may back into the riparian buffer.
   b. Place burn piles a minimum of 100 feet away from perennial and intermittent streams and 25 feet from ephemeral streams. Locate piles outside areas that may receive runoff from roads.
   c. Within CRLF habitat (less than 5,200 feet and within 300 feet of perennial or intermittent streams), prescribed burning would not take place during rain or within 4 days following a rain event depositing more than 0.25 inches. Directional hand pile lighting – all hand piles must be ignited on only one side of the pile, not to exceed half the circumference of the pile, on the side furthest from the nearest aquatic feature.

4. **Limited Operating Period.** During the wet season (defined as starting with the first frontal rain system that deposits a minimum of 0.25 inches of rain after October 15 and ending April 15), do not

perform mechanical operations within 300 feet of suitable habitat for California red-legged frog (e.g. intermittent or perennial streams, ponds, springs, and seeps).

5. Report incidental detections of federally-listed and sensitive aquatic species prior to or during project implementation to the District Fisheries Biologist for protection in accordance with management direction for the Tahoe National Forest.
6. If any California red-legged frog is found during the pre-activity survey or at any time during the Project, vacate the immediate area and leave the frog alone. No activity will occur in that area until such time as the frog has left the area on its own. Do not handle California red-legged frogs during any activity related to the Project.
7. To reduce the potential for adverse cumulative watershed effects, implement state certified Best Management Practices (BMPs). Site specific BMPs applicable to this project are located in project record file.

Soils

1. Unless large down woody debris exceeds 10 tons per acre, retain down large woody at a rate of 5 of the largest downed logs per acre. Preference is for large cull logs 20 inches or more in diameter and more than 40 cubic feet in volume. Avoid ignition of large woody debris in units slated for underburning. Avoid existing large woody debris and leave additional coarse wood on the ground (i.e. not grind it into the ground) in mastication areas.

Off-road Vehicle Use

1. Where brush, saplings or other live or dead vegetation exists, provide minimum 10-foot buffers on all sides of all recreation facilities, dispersed areas, and all designated NFS trails and NFS roads, and County roads for all vegetation management activities including post-harvest treatments. Exclude equipment from the buffer except at designated crossings. Consult trails manager or recreation officer at all phases of vegetation management operations, including pre-op meeting.
   a. The width of the buffer may vary depending on the density of vegetation in the site-specific area, the denser the vegetation, the narrower the buffer may be. Screening will be set back 30 to 70 feet in discontinuous segments with gaps less than 50 feet in length and staggered so as to limit visibility into the stand. Features such as cut-banks or rock outcrops which prevent visibility or vehicle access into a stand may be included as part of roadside screening.
   b. Flag the buffer prior to operations in designation by prescription (DxP) units.
   c. In individual tree mark (ITM) units, do not mark merchantable material within the buffer.
   d. Maximize protection of vegetated buffers during management treatments.
   e. To maintain the effectiveness of vegetated buffers, treat activity fuels by hand piling and burn (no mechanical piling) within 50 feet of ML 3, 4, and 5 roadsides.

VI. EXISTING ENVIRONMENT, EFFECTS OF THE PROJECT, AND DETERMINATIONS

Fire suppression, timber harvest, forest pathogens (insects and diseases), water management, and wildfires have been major influences on the existing condition of the project area and the surrounding landscape.

Fire Suppression

Stand conditions in the Sunny South Project area have been significantly altered by human activities since the 1880's. Historically, average canopy cover was lower compared to current canopy cover and forest structure and species diversity was more heterogeneous; mining and logging communities, fire salvage, densely planted plantations have led to overly dense stands. Because the project is at relatively low elevation, near private lands and communities, all of the project areas are designated under the Forest Plan as Threat or Defense zones in the Wildland Urban Interface (WUI). The Defense zone areas include parts of units BF1, SP-10, and S-1, and most of units SP-19, 20, 21, 23, and 24.

A significant change identified across the broader landscape is an increase in the percentage of trees in the 4 to 11 inch dbh size class for all conifer species with white fir having the greatest percentage (57%) of small stems (Estes 2011). Since the early 1900s, fire suppression policy has excluded most wildfire from the area. The mean historic fire return interval ranged from 15 to 30 years and current fire return interval ranges from 32 to 95+ years (Safford and Schmidt 2007). The trend towards more shade-tolerant species is ongoing. The stands that burned in the 1960 Volcano Fire were heavily managed and planted densely in ponderosa pine, limiting the diversity and density of other species such as oak and white fir found in more natural stands.

Timber Harvest

Historic logging in the area was primarily associated with mining activity. Typically, the largest, most accessible ponderosa and sugar pines were cut to meet the timber demands of the mines. Several small, localized mills were located throughout the area to service those needs.

Past logging practices have influenced stand conditions in the Sunny South project area. Numerous plantations were established as a result of the 1960 Volcano Fire and various even-aged management activities. Established between the 1970's and 1990's, they are generally comprised of mixed-conifer species with a varying shrub component. The Volcano plantations were established with tractor-contoured ground and consist almost entirely of ponderosa pine; species diversity is limited, as is snag, log, and understory vegetation densities. Plantations cover a total of approximately 33% of the overall project area.

Insects and Disease

Native insects and pathogens of forest trees perform important functions in natural ecosystems; creating cavities, snags, and down woody habitat, recycling nutrients, and creating gaps for regeneration. Under historic disturbance regimes in Sierra mixed-conifer forests, these organisms remained at levels where they did not cause rapid, large-scale changes in the structure or composition of the forest. Several insects and diseases are common in the planning area, including the fir engraver, *heterobasidion* root disease, dwarf mistletoe, and white pine blister rust. The Sugar Pine area also has a band of serpenitic soils that limit growth or kill trees; these areas may be more at risk when combined with other stressors such as the recent extended drought, crowding, as stands continue to develop, or fire. A small thinning project was implemented several years ago along upper Shirttail Creek in response to bugkill in several stands.

Wildfires

The project areas have not been exposed to recent fire; the Forest Service Seed Orchard unit (S1), the Michigan Bluff units, and most of the units east of Sugar Pine Reservoir burned at high severity and were replanted after the Volcano Fire in 1960. As a result these units are relatively uniform, single-age ponderosa pine stands. The Big Oak Flat unit (BF1) hasn't burned since 1924 and so contains more species and age diversity.

Human Activities

The Sugar Pine Reservoir receives heavy recreational use due to its close proximity to Sacramento (about 1.5 hours), providing an easy "escape" to the mountains and from summer heat. The lake has several campgrounds and is used for boating, swimming, fishing, hiking, and camping. The surrounding area also contains a developed trail system for OHV, and is also popular for dispersed camping and recreational target shooting. The heavy human use and relatively loud activities result in relatively high ongoing disturbance for wildlife species.

Forest Composition

The Sunny South Project area is currently characterized by moderately dense ponderosa pine plantations and dense mixed conifer stands with a high component of shade tolerant white fir, incense-cedar, and Douglas-fir that can become established and outcompete pines in drainages and under the shade of other trees. The plantations are beginning to resemble natural stands, but are clearly more open and uniform in size and species composition than the older stands, as shown in Table 5. Dense stands in the project area are susceptible to insect and disease-related attack, especially during periods of extended drought, and are at greater risk of high mortality levels in the near future due to the current high stand densities. Competition among trees for limited resources, such as water, nutrients, and sunlight, create unsustainable demands.

Table 5. Contrasting Forest Composition in Plantations and Older Stands in the Sunny South Project Are

Stand Type	Mean QMD[1]	Mean Canopy Cover	Large Trees (>30" dbh)/ acre
Plantation	20.7	70.5	7.3
Older Stands	22.5	77.8	13.4

[1] The quadratic mean diameter (QMD) is a measure of the average dbh which is weighted toward the larger, dominant trees. Canopy Cover consists of all vegetation over 2 meters in height. Large tree density based on a 10-acre moving window to show concentrations, not to account for every single large tree. All data derived from LiDAR (Light Detection and Ranging, a form of remote sensing that uses a pulsed laser to collect very accurate and detailed data) collected in 2014.

California black oak (*Quercus kelloggii*) and madrone (*Arbutus menzeisii*) are both hardwoods that are widely distributed throughout the project areas, but lacking in the plantations. These species do not grow as tall as their conifer associates and depend periodic disturbance to provide openings in the canopy. Fire, logging, blow-down, insect outbreaks, or mass soil movement provide the disturbed and temporarily vegetation-free ground needed for establishing oaks (McDonald and others 1983). The aboveground portions of both species are killed in large wildfires, but they typically resprout from the roots and grow rapidly. Continued absence of disturbance allows conifers to overtop and eventually shade out and crowd hardwoods (McDonald and Tappenier 1997). In the project area, conifers are crowding and overtopping the hardwoods particularly in the Big Oak Flat area. In these shaded conditions, the hardwoods will decline and fail to regenerate.

Dead trees (snags) and logs are important habitat components for many wildlife species; they provide structural diversity, nesting, roosting, and denning habitat, cover, prey habitat, and soil nutrients. The Forest Plan, as amended, suggests wildlife habitat goals of at least 4 snags and sufficient log densities, which was previously defined as 10-20 tons per acre of logs over 12" diameter. Large snags are particularly valuable to wildlife, because they can support species that require larger sizes as well as those that can utilize smaller snags.

Despite the value of snags for wildlife, they are often felled to maintain road and trail systems, for safety during vegetation management operations and near private property, and may also be lost to prescribed fire. Removing snags in turn affects the timing and extent of recruitment of new logs. Both logs and snags can be lost to recreational wood cutters if they are near roads, as well as to prescribed fire. In order to maintain 3-4 snags and sufficient logs per acre across the landscape, it may be necessary to retain more snags and logs in key areas in recognition of the many areas must be managed for lower numbers of snags. Because PACs contain older trees and receive limited vegetation management, they are likely to have higher densities of snags and logs.

Existing densities of dead trees (snags) within the project area are generally low, except in the recently killed stands, in part because the many plantations are relatively young and in part due to past stand thinning to reduce competition, and ongoing removal of snags that pose hazards to roads, campgrounds, and other sites. The pockets of new snags provide some additional habitat value for snag-dependent species in the stands where they occur, although most have not yet deteriorated to the point of providing substantial decay and cavities.

Mature forest stands with high wildlife values may have 10-20 tons of downed wood per acre. Downed wood information was collected for fuels analysis, which classified downed wood as 0-3" diameter, 3-20" and over 20" diameter. While some units had no logs over 20", overall, they averaged 4 tons per acre in the treatment units, which is relatively high for larger logs. Downed wood between 3 and 20" diameter occurred in every unit, which would include some logs with high value to wildlife. Overall, the project area appears to have a relatively high density of logs, providing important wildlife value. The many existing snags are expected to fall periodically and contribute to the numbers of logs. These numbers do not include smaller snags and downed woody material, of which the project area contains a great deal more, as described in the Fuels Report (Castro 2012).

There is a broad 1.5-mile band of varying depth serpentine soils running from north to south from the Foresthill Divide Road north through Sugar Pine Reservoir. These soils contain high magnesium and iron content, high concentrations of toxic heavy metals, and low concentrations of other important minerals, making them poor soils for many plants, limiting establishment of many plants, stunting their growth, and greatly limiting trees. Because of this, there are areas of relatively open brush that naturally fragment forested habitat in the area. The Volcano plantations are just east of the serpentine area.

SPECIES-SPECIFIC ANALYSIS AND DETERMINATION

This section discusses each species in three parts, A) Existing Environment; B) Effects of the Proposed Action and Alternative including management requirements; and C) Conclusion and Determination.

Section A describes the existing environment including species life history, status, and relevant information. Further detail can be found in the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement and Record of Decision (SNFPA 2001; USDA Forest Service 2001) and Sierra Nevada Forest Plan Amendment Record of Decision and Final Supplemental Environmental Impact Statement and Record of Decision (SNFPA 2004; USDA Forest Service 2004).

Section B addresses the effects of the proposed project to each species including management requirements. Effects are described as direct, indirect, or cumulative. Direct effects as described in this evaluation refer to mortality or disturbances that result in alterations in fitness, flushing, displacement or harassment of the plant or animal. Indirect effects refer to modification of habitat and/or effects to related (e.g. pollinator or prey) species. Cumulative effects represent "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (National Environmental Policy Act 1986). If the cumulative effects involve a federally-listed species, the definition expands to address "those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation" (Endangered Species Act, 1973 as amended).

Section C provides a summary of supporting conclusions and the statement of determination for each species based upon relevant information provided in Sections A and B.

Analysis Methods

The existing condition of vegetation within treatment units was derived using limited stand exam plot data as well as vegetation maps, aerial imagery, and site visits. The Forest Vegetation Simulator (FVS) (Dixon 2003) was used to model changes to vegetation that would result from the proposed action. The existing condition of forest vegetation and the changes that would likely occur as a result of the proposed action, as they relate to wildlife habitat suitability, are quantified in these analyses using the California Wildlife Habitats Relationships (CWHR) computer program developed by California Department of Fish and Game (2005). The CWHR program describes vegetation conditions through metrics such as tree size classes and canopy closureand functions as a predictive model of habitat suitability for wildlife species. Habitat suitability within each vegetation type is ranked as 0.0 (not suitable), 0.33 (low), 0.66 (moderate), or 1.0 (highly suitable) for each wildlife species. Changes in vegetation condition are therefore correlated to changes in habitat suitability. This correlation provides a useful tool to estimate the direction and magnitude of changes in wildlife habitat suitability caused by changes in vegetation condition as a result of the propose project. Habitat suitability as described by the CWHR is updated in this report to reflect any changes to what is described as suitable habitat based on the latest research. Current habitat is analyzed using ESRI Geographic Information System (GIS) ArcMap 10.1. GIS analysis was conducted using the most recent Tahoe National Forest Vegetation layer, along with preliminary LiDAR data.

Cumulative Effects – Past, Present, and Reasonably Foreseeable Future Actions

In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or events contributed to those effects. Finally the Council on Environmental Quality issued an interpretive memorandum on June 34, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, the analysis of past actions in this section is based on current environmental conditions. Nevertheless, in order to provide some context for past cumulative impacts, a description of recent past actions (20 years) is discussed.

A 38,189-acre wildlife analysis area extends 1.5 miles beyond the project units and is used in this Biological Evaluation to analyze cumulative effects to Forest Service sensitive species and their habitats, including effect from past, present, and reasonably foreseeable future actions. This area is large enough to encompass the known home ranges of species being analyzed, yet not so large as to mask any potential effects of the proposed action. Of this area, approximately 28,257 acres are on the TNF; the remaining 9,932 acres are privately owned.

Past, present, and reasonably foreseeable future actions on forest land that have or will occur within the analysis area over the last 20 years (1996-2016) or next 20 years (2016-2036), and a general description of the actions' effects on wildlife habitats are summarized in Table 6. The footprint of activities on forest land that have occurred over the past 20 years is about 12,441 acres or 44% of the 38,139 acre analysis area.

Present and reasonably foreseeable future actions occurring within the Analysis Area includes the Biggie and Cuckoo Fuel Reduction and Vegetation Management Projects, which overlaps about 3,079 acres in the analysis area near Big Oak Flat. The Cuckoo treatment areas are preliminary, so these acres are those within the larger boundary, not planned treatment areas; the Biggie treatment areas are closer to being finalized. The general effects of the Biggie and Cuckoo project are expected to result in various degrees of short-term habitat change at the patch-scale, including commercial thinning of conifers, but overall project design standards are to maintain suitable habitat for the goshawk, marten, and spotted owl at the stand or landscape scale. Pre-commercial thinning small diameter trees, typically <10 inch dbh, and fuels treatments would result in more open and homogeneous understory conditions in the short term that would likely have localized impacts to prey species including small mammals and songbirds by reducing cover needed for resting, foraging, and nesting. Both of these projects will likely include fuels reduction, hazard tree removal along roads, oak enhancement, and road decommissioning as well.

The analysis area includes the Foresthill Seed Orchard, located alongside the Foresthill Divide Road, and consists of approximately 430 acres. The Seed Orchard is intensively managed for particular conifer genetics and the resulting cone crops. This area receives ongoing management, including understory vegetation control, planting, fertilization, weeding, pruning, pre-commercial and commercial thinning, even-aged harvest, chipping, gopher and insect control, pile burning, and low-intensity understory burning,.

Other projects in the analysis area include the recent Deadwood Vegetation Management and Fuels Reduction Project, which was about 4,000 acres, including commercial and precommercial thinning, fuels reduction, fuelbreaks, prescribed burning, and roadwork; the Oliver Insect Salvage project, Bear Wallow Thinning project, Big Reservoir project, End of the World project, Giant project, Iowa Hill Shaded Fuelbreak, and the Shirttail Succor Oak Fuel Reduction project. Most of these projects included a combination of commercial and precommercial thinning fuels reduction, and prescribed burning. The Sugar Pine Reservoir area receives heavy recreational use and small maintenance and improvement projects associated with the established campgrounds, OHV trails, and the reservoir, which provides residential water for the community of Foresthill. The various types of treatments outside the Seed orchard are quantified below in Table 6.

It is likely that other projects will occur within the Analysis Area within the next 20 years but they have not yet been developed and therefore cannot be quantified.

Table 6. General Cumulative Effects: Summarized Effects of Past (1996-2016), Present, and Reasonably Foreseeable Future Actions (2016-2036).

Activity	Effects of Past, Present, and Reasonably Foreseeable Future Actions	Acres
Past Activities		
Commercial Thinning	Reduction in canopy cover resulting in reduced habitat quality and some cases habitat quantity for late-successional wildlife species including marten, goshawk, and spotted owl. Reduces competition among trees, increases vigor and resilience.	6,080
Private Land Timber Harvest	A variety of possible timber harvest techniques/ objectives, but typically more overstory removal than on TNF, reducing overstory canopy cover and increasing early seral habitat for deer and mountain quail.	2,700
Pre-Commercial Thinning	Removal of trees <6-10 inch dbh creating a more open understory tree layer. Reduces competition among trees, increases vigor and resilience.	6,135
Fuel Reduction of shrubs and small diameter trees	More open understory, reducing habitat available for small mammal and bird species used for resting, foraging, and/or nesting in the short term. May benefit goshawk with more open flight corridors within the tree understory. No changes to overstory canopy cover.	3,948
Group Selection-removal of all trees <30" dbh on up to 1 acre	Increase in habitat for early seral species, increase in forest seral stage diversity across units, likely not to alter overall suitability of habitat for mature to late-seral forests species.	719
Tree Planting	Reduction in the timeframe that shrub dominated habitats will return to mid and late seral forests.	4,381
Site Preparation for planting	Clearing of shrub vegetation that would compete with tree seedlings. Some loss of understory/ shrub habitat with similar effects to fuel reduction.	2,170
Seed Tree Cut	Long-term removal/loss of late-successional habitat for marten, goshawk, spotted owl, increased early seral habitat for deer and mountain quail.	555
Thinning for Hazardous Fuels Reduction	Short-term reduction in foraging habitat quality for late-seral species, such as goshawk, spotted owl, and Pacific marten, Long-term benefits from increase forest resiliency.	918
Tree Release and Weed	More open understory potentially affecting small mammal and bird species in the short term. No affects to overstory canopy cover.	6,356
Underburning	More open understory resulting in reduced habitat quality and quantity for some small mammal and bird species in the short term. No affects to overstory canopy cover.	3,416
Roadside Hazard Tree Removal	Removal/loss of a minimal number of trees and snags. Should not affect canopy cover or change overall habitat structure. Removal of a minimal number of snags and dying trees has a slightly negative effect to habitat quality and important habitat components needed for denning, resting, and foraging for marten, goshawk, and spotted owl.	75
Present and Reasonably Foreseeable Future Actions		
Roadside Hazard Tree Removal	Removal/loss of a minimal number of trees and snags. Should not affect canopy cover or change overall habitat structure. Removal of a minimal number of snags and dying trees has a slightly negative effect to habitat quality and important habitat components needed for denning, resting, and foraging for marten, goshawk, and spotted owl.	145
Commercial thinning	Reduction in canopy cover resulting in reduced habitat quantity for late-successional wildlife species including marten, goshawk, and spotted owl.	133
Underburning	More open understory resulting in reduced habitat quality and quantity for small mammal and bird species in the short term. No affects to overstory canopy cover.	133
OHV Reroutes	Replacing routes with excessive erosion with better routes. Minor loss of vegetation and habitat fragmentation with additional associated disturbance; somewhat offset by restoration and eliminated use on closed routes.	1.4 miles (net)
Sugar Pine Reservoir Inundation	Proposed raising of lake level at Sugar Pine Reservoir; estimated 38 acres of Sierra mixed conifer, 2 acres of emergent vegetation, and 2 acres of open chaparral habitat.	42
Cattle Grazing	Ongoing and revised grazing allotment in the Big Oak Flat area affects herbaceous and shrub layer, reducing cover and forage for various wildlife species. Revised plan would reduce impacts to riparian habitats (monitored sites, fencing, and other measures).	5,932

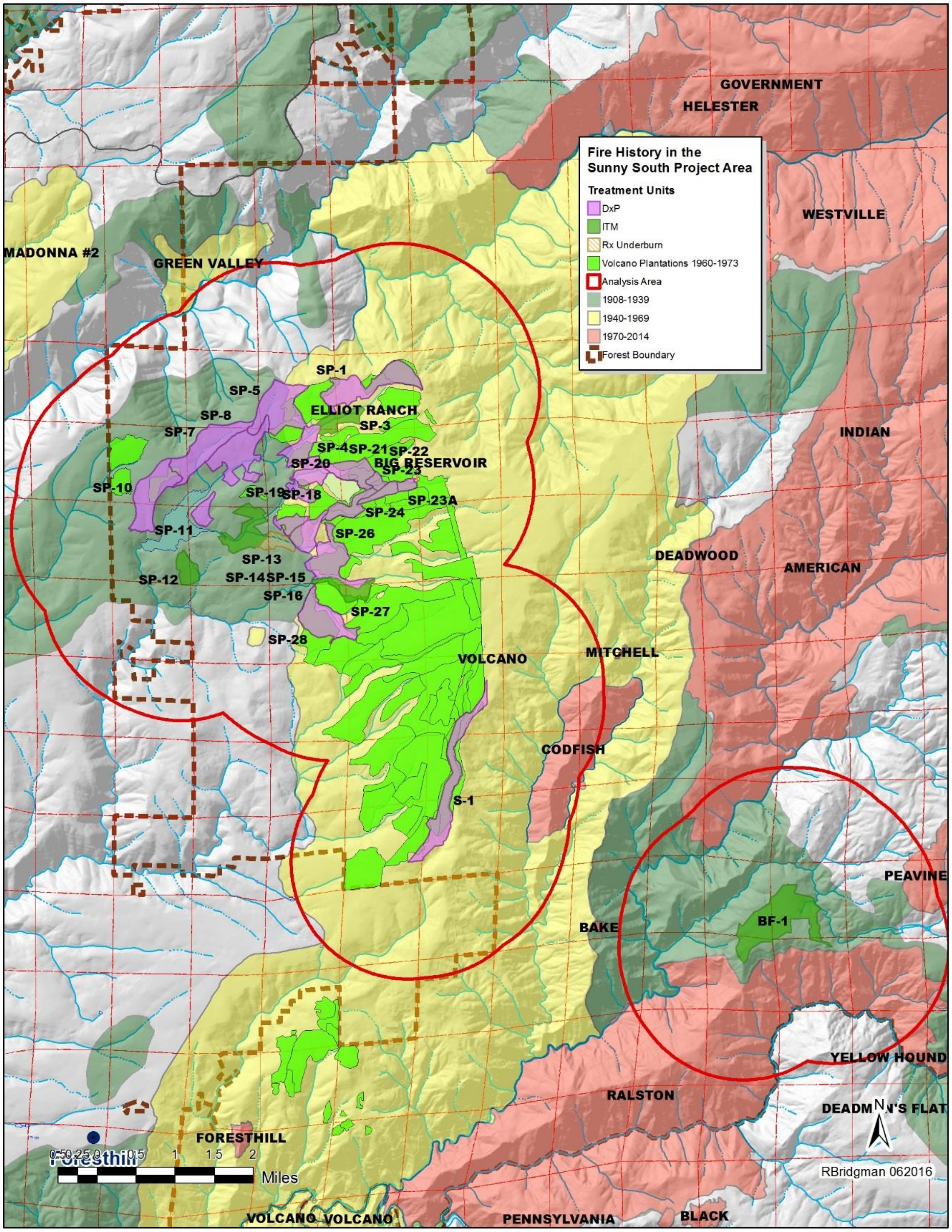
Past projects overlapped extensively; particularly if areas were harvested or thinned under various prescriptions they may have then undergone multiple treatments such as pre-commercial thinning followed by commercial thinning and underburning all within the same footprint. The past vegetation management activities on the TNF were generally aimed at reducing small-to-medium diameter materials (e.g. shrubs and trees less than 24 inches dbh) for fuel reduction; however, some larger diameter (up to 30 inches dbh) trees typically were removed, particularly during salvage, commercial thinning, clear cutting, group selection, seed tree, and overstory removal prescriptions.

Most of the recent vegetation management activities in natural stands are focused on forest health and fuels reduction treatments that protected and maintained large trees, retention of canopy cover, snags, and down logs for wildlife, while reducing the risk of stand-replacing catastrophic wildfires. Activities in plantations tend to include more aggressive thinning to ensure the continued survival of planted trees. Together these projects resulted in various degrees of short-term habitat change at the patch-scale, but overall project design standards were to maintain suitable habitat for the goshawk, marten, and spotted owl at the stand or landscape scale.

In the past 20 years the American Fire (2013) affected about 330 acres and the Ralston Fire (2007) affected another 2,480 acres within the analysis area, both near the Big Oak Flat area, coming from nearby canyons. In burned areas that were salvage logged, habitat attributes important to many species such as large logs and snags were greatly reduced. The heavy use and steep river canyons have resulted in an extensive fire history in the surrounding landscape. The Volcano Fire (1960) affected 18,293 acres in the analysis areas, and led to extensive reforestation efforts and dense stands of pines including those in the project area, that have required recent thinning efforts. Approximately 5,778 acres of Volcano plantations are within the analysis area and of those, about 915 acres of plantations are within the proposed Sunny South project. Prior to the Volcano Fire, much of the remaining areas in the analysis area burned in 1924 near Big Oak Flat and 1936 near Sugar Pine Reservoir; these areas have largely recovered and resemble natural stands more than the Volcano plantations.

Private land accounts for 9,932 acres or 26% of the analysis area. According to the THP records database referenced (ftp://ftp.fire.ca.gov/forest/) which included treatments back to 1997, 2,700 acres have been treated with the analysis area. Fire salvage is not recorded in the database as it is considered an emergency action but some of the private lands that burned in the Ralston fire within the analysis area that burned at moderate to high severity may have been logged.

Figure 2. Wildfire History in Sunny South Area (1960 Volcano Fire in yellow)



Terrestrial Species

BALD EAGLE

A. Existing Environment

Pertinent regulatory history and status:

- 2007: Bald eagle delisted from the List of Endangered and Threatened Wildlife (USFWS 2007d; 72 FR 37346). At the time of delisting, the bald eagle was placed on the USFS R5 Sensitive Species List. In anticipation of delisting the bald eagle, the U. S. Fish and Wildlife Service issued National Bald Eagle Management Guidelines (USFWS 2007a), a regulatory definition of "disturb" under the Bald and Golden Eagle Protection Act (USFWS 2007b; 72 FR 31132), and proposed new permit regulations to authorize take under the Bald and Golden Eagle Protection Act (USFWS 2007c; 72 FR 31141).
- Bald eagles continue to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (Eagle Act).

Bald eagle nesting and wintering habitat occurs throughout the Pacific Southwest Region, which includes both the Sierra Nevada and Klamath Provinces. The Tahoe National Forest LRMP (Forest Plan) outlines management of bald eagle nesting and wintering habitats for target populations as specified in the species recovery plan. A Tahoe National Forest Bald Eagle Management Plan (April 2, 2004) was submitted to the USFWS. The SNFPA provided no new standards and guidelines for bald eagle management. Conservation recommendations from the Biological Opinion for the SNFPA (FWS 2001) are included as management recommendations within the Tahoe National Forest Bald Eagle Management Plan. The USFWS published National Bald Eagle Management Guidelines in May 2007.

Nesting territories are normally associated with lakes, reservoirs, rivers or large streams (Lehman 1979). Bald eagle nests are usually located in uneven-aged (multi-storied) stands with old growth components (Anthony et al. 1982). Most nests in California are located in predominantly coniferous stands. Factors such as relative tree height, diameter, species, and position on the surrounding topography, distance from water, and distance from disturbance also appear to influence nest site selection (Grubb 1976, Lehman et al. 1980, Anthony and Isaacs 1981).

Trees selected for nesting are characteristically one of the largest in the stand or at least codominant with the overstory. Nest trees usually provide an unobstructed view of the associated water body and are often prominently located on the topography. Live, mature trees with deformed tops are occasionally selected for nesting. Of nest trees identified in California, about 71 percent were ponderosa pine, 16 percent were sugar pine, and 5 percent were incense cedar. The remaining 8 percent were distributed among five other coniferous species. Eagle nests may be located in snags, but most nests are probably constructed when trees were alive (Anthony and Isaacs 1989). Nest tree characteristics in California have been defined by Lehman (1980) as being 41 to 46 inches in diameter at breast height and in excess of 100 feet tall.

In California, 73 percent of the nest sites were within 0.5 mile of a body of water, and 89 percent within 1 mile. No nests were known to be over 2 miles from water. Of 21 nests in Oregon, Anthony and Isaacs (1989) found 85% were within one mile of water. Bald eagles often construct several nests within a territory and alternate between them from year to year. Up to five alternative nests may be constructed within a single territory (U. S. Fish and Wildlife Service 1986).

Snags, trees with exposed lateral limbs, or trees with dead tops are often present in nesting territories and are used for perching or as points of access to and from the nest. Such trees also provide vantage points from which territories can be guarded and defended. Andrew and Mosher (1982) found that successful nests were in denser forest stands farther from human disturbance than were unsuccessful ones. They identify the most important characteristics of bald eagle nesting habitat in the Chesapeake Bay as being close to water and having open mature vegetation structure that allows for easy flight.

Breeding is initiated as early as January 1 via courtship, pair bonding, and territory establishment, and normally ends approximately August 31, as the fledglings are no longer attached to the immediate nest site. This time frame may vary with local conditions and knowledge. Incubation may begin in late February to mid-March, with the nestling period extending to as late as the end of June. From June through August, the fledglings remain restricted to the nest until they are able to move around within their environment.

Anthony and Isaacs (1985) found negative relationships between eagle productivity and human activities, particularly logging activities. Effective breeding area management should avoid a flight response that is typically induced by disturbance at 200 to 300 m (Grubb et al. 1992). In their study of breeding bald eagle responses to human activities, Grubb et al. (1992) recommend a no activity primary zone of 500 to 600 m (1640 to 1968 feet) from nest sites, followed by a secondary zone of 1000 to 1200 m (3280 to 3936 feet).

Wintering habitat is associated with open bodies of water, primarily in the Klamath Basin (Dietrich 1981, 1982). Smaller concentrations of wintering birds are found at most of the larger lakes, at man-made reservoirs in the mountainous interior of the north half of the state, and at scattered reservoirs in central and southwestern California. Some of the state's breeding eagles winter near their nesting territories.

In southwestern National Forests, Grubb and Kennedy (1982) found that although live ponderosa pine trees were the most prevalent perch trees available to eagles, they preferred to use snags instead of living trees. Use of a perch tree relates to the habitat that surrounds it. Perches were oriented to provide all of the following, but not necessarily all at the same time: (1) a good view of the adjacent water and surrounding area; (2) maximum exposure to the sun, especially during morning hours on cold days; (3) maximum benefit of topography and diurnal wind currents for flight. They found eagles selecting for perches that provide good visibility, and this is influenced by three interrelated characteristics: openness, height of the substrate, and the height of the surrounding vegetation. As foliar density of the surrounding vegetation increased, or the height of the vegetation or hill increased, so did the need for higher perches. Usually eagles chose the largest trees with suitable branches.

Habitat requirements for communal night roosting are different from those for diurnal perching. Communal roosts are invariably near a rich food resource. In forest stands that are uneven-aged, communal roosts have at least a remnant of old-growth forest components (Anthony et al. 1982). Most communal winter roosts used by bald eagles throughout the Pacific recovery areas offer considerably more protection from the weather than diurnal habitat. Of three night roosts studied in southwestern National Forests, all were in ponderosa pine stands several hundred yards to several miles from the daytime water resource (Grubb and Kennedy 1982). Most roost trees were living and well foliated, but with large "windows" in the canopy. In five communal roosts in the Klamath Basin, Keister and Anthony (1983) found that bald eagles used old-growth forest stands as far as 9.6 miles from the food source. Defoliated trees such as snags, spike-topped conifers, and large deciduous trees were especially preferred.

The most common food sources for bald eagle in the Pacific region are fish, waterfowl, jackrabbits, and various types of carrion (USFWS 1986). In the winter, major prey may include: waterfowl, ungulate carrion, and small mammalian prey (Grubb and Kennedy 1982, Grubb 1995b). The kinds of prey selected changes depending on its availability.

Many studies show that eagles avoid or are adversely affected by human disturbance (Stalmaster and Newman 1978, Andrew and Mosher 1982, Fraser 1985, Fraser et al. 1985, Knight and Skagen 1987, Buehler et al. 1991, Grubb and King 1991, Grubb et al. 1992, Chandler et al. 1995, Grubb et al. 1995, Mathisen et al. 1997). Disturbance is most critical during: nest building, courtship, egg laying and incubation (Dietrich 1990). Grubb et al. (1992) found that eagles are disturbed by most activities that occur within 1500 feet; and they take flight when activities occur within 600 feet. Mathisen et al. (1997) recommend that managers avoid any activities within 500 to 600 meters (1640 to 1968 feet) from a nest. They also recommend that any activities occurring within a secondary zone of 1000 to 1200 meters (3280 to 3936 feet) minimize the duration of the disturbance and avoid causing a flight response.

Eagles are disturbed differently depending on the kind of disturbance, the noise that it creates, the length of time that it lasts, and its location. Eagles are more disturbed as noise levels increase, the source of the disturbance gets closer, and by unusual disturbances not normally occurring in a particular area. Grubb and King (1991) and Grubb et al. (1992) found that pedestrian activities were the most disturbing group of human activities, followed by boats and vehicles. Among aircraft, helicopters elicited the highest disturbance response from eagles, frequently causing them to fly. They recommend permitting only short duration flights within 1100 m (3600 ft) of a nest (Grubb and King 1991), and they found that a greater frequency of disturbances appeared to have a greater effect on breeding eagles (Grubb et al. 1992). Position is also important, with activities located above an eagle being more disturbing than below.

Within the Tahoe National Forest, twelve breeding territories have been identified within the forest boundary; the nearest of these is at Spaulding Reservoir, approximately 15 miles north of the Sunny South project area. Seven nest territories are on National Forest System land (2 at Stampede Reservoir, 1 each at Boca Reservoir, Bullards Bar Reservoir, Independence Lake, Prosser Reservoir and Deer Creek). Four nesting territories on private land occur within the forest boundary; one each at Fordyce Reservoir, Webber Lake, Spaulding Reservoir, and south of Milton Reservoir, and there is one nesting territory on State land at Donner Lake. Meadow Lake had fledglings in 2002 but no nest was located.

The Tahoe National Forest lies within Zone 28 (Sierra-Nevada Mountains) of the Pacific Bald Eagle Recovery Area (USFWS 1986, p.138). Recovery goals identify a target of six territories on the forest, three territories at Bullards Bar Reservoir, and one territory each for Stampede, Boca, and Jackson Meadows. Considering the previously mentioned twelve territories within the Tahoe National Forest (assuming the Milton Reservoir territory substitutes for Jackson because of its close proximity), recovery goals for the numbers of territories have been met.

Potential risk factors to the bald eagle from resource management activities include modification or loss of habitat or habitat components (primarily large trees) and behavioral disturbance to nesting eagles from vegetation treatment, facilities maintenance, recreation, or other associated activities within occupied habitat, which could prevent or inhibit nesting or lead to nest failure (USDA Forest Service 2001).

Bald eagles are known to occur in the project area, generally passing through the area on the way to or from a large water body. The Middle Fork and North Fork American River (0.7 mile and 1 mile, respectively, from the project area), Sugar Pine Reservoir or Big Reservoir (both reservoirs are directly adjacent to the project area) provides suitable nesting habitat, but nesting bald eagles have not been detected at these locations. There are no known bald eagle nest or roost sites within the Sunny South Project Analysis Area. Bald eagles were not detected during the most recent 2016 midwinter survey at four reservoirs on the American River Ranger district, but there was one detection at Sugar Pine Reservoir in January 2016, outside of the survey.

B. Effects

Direct and Indirect Effects

The proposed action has the potential to cause direct, disturbance-type effects (e.g. flushing a perched individual) if bald eagles are passing through, or foraging in the project area (e.g. foraging in the vicinity of Sugar Pine or Big Reservoir). Disturbance would be in association with project activities such as felling trees, prescribed burning, or the operation of heavy equipment. There are no known nesting bald eagles in the analysis area. Disturbance-type effects, if they occur, are expected to be brief and slight. If bald eagles are discovered nesting during project implementation, project activities would be limited during the breeding season at a distance determined by the district wildlife biologist necessary to minimize disturbance.

The proposed action has the potential to reduce bald eagle habitat by removing large trees in the vicinity of Sugar Pine and Big Reservoirs. Large trees and snags would be retained within project units where possible. Conversely project activities are expected to improve stand conditions (e.g. increasing resources available to large trees) and reduce the potential for adverse effects from tree pathogens or a high severity wildfire. These effects are expected to be slight, beneficial, and long term as treated stands mature. Road decompaction may improve habitat slightly in the long-term by improving stand continuity and reducing human disturbance.

Cumulative Effects

To assess how the effects of the proposed action could incrementally add to the effects of past, present, and future actions, bald eagle habitat was assessed within 1.5 miles of the treatment units.

Specific past, present, and reasonably foreseeable future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 12,441 acres. Recent activities have mainly retained large trees that would provide preferred nesting and roosting sites. Additionally, 3,629 acres within the analysis area has burned at least once in the past 20 years. None of these fires were within 0.5 miles of Sugar Pine Reservoir or Big Reservoir. These past treatments have slightly reduced habitat quality but would not reduce habitat suitability. The fires may have reduced habitat suitability depending on severity. Details of past, present and reasonably foreseeable future projects are found above.

The proposed action could contribute to a slight reduction in large diameter trees if they shows signs of insect infestation. This could in turn reduce available large trees that could be used for nesting or roosting sites though most of the project exceeds the distance from water in which bald eagles select for nesting. Foreseeably future projects would have similar effects to the proposed action of continued vegetation management, conservation of snags, and allowances for nesting eagles.

C. Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the bald eagle.

Rationale:

- Habitat suitability would not be reduced.
- There is a low chance of disturbance to individual bald eagle during project implementation.
- Important habitat attributes would be retained where possible (large snags and down woody material).

CALIFORNIA SPOTTED OWL

A. Existing Environment

The California spotted owl is on the USFS R5 Sensitive Species List for the Tahoe National Forest and is a management indicator species on all National Forests in the Sierra Nevada Bioregion. There are three subspecies of spotted owls: the California spotted owl, the northern spotted owl, and the Mexican spotted owl. Both the northern and Mexican subspecies are listed as Threatened by the USFWS. The three subspecies occupy fairly geographically distinct areas, with the California spotted owl in the southern Cascades south throughout the Sierra Nevada mountains, the mountainous regions of southern California, and the central coast ranges at least as far north as Monterey County (Gutiérrez and Barrowclough 2005). The elevation of known nest sites range from about 1,000 feet to 7,700 feet, with about 86 percent occurring between 3,000 and 7,000 feet. The California spotted owl was petitioned for listing as Threatened or Endangered, but upon status review the USFWS found it did not warranted listing, most recently on May 24, 2006 (USFWS 2003; 68 FR 7580, USFWS 2006; 71 FR 29886). In December 2014 another petition for listing under the ESA was filed with USFWS.

The Forest Plan, as amended in 2004, includes conservation strategies to maintain environmental conditions and habitat for old forest associated species in the Sierra Nevada, particularly the California spotted owl. The strategy seeks to maintain canopy cover, large trees, and other components such as logs and snags that are known to be important to California spotted owls, while addressing the need to reduce the threat of stand-replacing wildfires to owl habitat (USDA Forest Service 2004). Although spotted owls are known to use burned forest after fires, burned forest habitat is short-lived, and is typically replaced by unsuitable shrubs or small trees within a decade, and can take over a century to return to mature forest conditions.

In February 2003, the Tahoe National Forest refined existing PACs and HRCAs and delineated new ones according to direction in the SNFPA (USDA Forest Service 2001). This work is updated at least once a year to add new, or revise boundaries of existing PACs and HRCAs. There are approximately 201,577 acres included within approximately 196 PAC/HRCAs in the Tahoe National Forest. Surveys for the California spotted owl have been conducted in the Tahoe National Forest since the late 1970s; some territories are monitored yearly as part of a regional demography study. Surveys conducted in the Tahoe National Forest follow the Pacific Southwest Region Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas (USDA Forest Service, March 12, 1991, revised February 1993).

Spotted owl home range sizes are extremely variable across their range, and are suspected to be linked to availability of prey (Verner et al. 1992b, Zabel et al. 1992, Zabel et al. 1995, Bingham and Noon 1997). Bingham and Noon (1997) found that home range sizes of California spotted owls on Lassen National Forest (n = 4) averaged 6-8 times larger than estimates for northern spotted owls (n = 20) and noted that this is believed to reflect differences in habitat composition and prey availability rather than subspecific differences. California spotted owl home range is smallest in habitats at relatively low elevations that are dominated by hardwoods, intermediate in size in mixed-conifer forests, and largest in true fir forests (Zabel et al. 1992). At the time of the CASPO report in 1992, in the Sierra conifer forests a rough estimate of mean home range for California spotted owl pairs based on available information was 4,200 acres (Zabel et al. 1992).

California spotted owl habitat can be assessed at multiple scales. On the Eldorado study area, Chatfield (2005) modeled habitat with circular plots centered on owl nest and/or roost locations of approximately 100, 300, and 1,170 acres, representing the nest stand, PAC, and territory scales, respectively. Seamans (2005) analyzed owls on the Eldorado study area and defined a territory as a circle with radius half the mean nearest neighbor distance of occupied territories, resulting in a circle encompassing 988 acres. Seamans (2005) found that this territory size (988 acres) encompassed >90% of all known roosts. Berigan et al (2012) found that the 300-acre PAC of the best, most mature habitat around activity centers appeared to account for much of the areas used by owls during the nesting season.

California spotted owls utilize Sierra mixed conifer, ponderosa pine, red fir and montane hardwood forest types with high structural diversity, and dominated by medium (12-24") and large (>24") trees and with moderate to high levels of canopy cover (generally >40%) (Bias and Gutiérrez 1992, Call et al. 1992, Gutiérrez et al.1992, Verner et al. 1992b, Zabel et al. 1992, Moen and Gutiérrez 1997, Blakesley 2003, Blakesley et al. 2005, Chatfield 2005, Lee and Irwin 2005, Seamans 2005). Optimal habitat conditions likely include differing compositions and densities of forest stands (Bias and Gutiérrez 1992, LaHaye et al. 1997, Irwin et al. 2007). Chatfield (2005) found the probability of spotted owl occupancy was associated with increasing amounts of mid-seral forest having high (>70%) canopy cover and late-seral forest having at least 30% canopy cover. Tempel et al (2014) similarly found a strong correlation of site occupancy with mid and late seral mixed-conifer forests with high canopy cover (>70%). Hunsaker et al. (2002) found that nesting territories (approximate 1000-acre circle around an activity center) in the southern Sierra Nevada had a *median* proportion of 60 percent of the territory with ≥50% canopy cover (i.e. one-half of the nesting territories in the study area had less than 60% of the territory with ≥50% canopy cover, and one-half of the nesting territories in the study area had more than 60% of the territory with ≥50% canopy cover). Lee and Irwin (2005) further analyzed the data presented in Hunsaker et al. (2002) and found a possible minimum threshold for nesting to occur in a territory (approximate 1000-acre circle around an activity center) to be 44% or more of the territory with ≥40% canopy cover, and that there was no significant benefit to reproduction with increasing levels of canopy cover above the threshold; "the pattern suggested a possible minimum requirement rather than a trend, with no increasing benefit to reproduction of additional amounts of intermediate [40-70%] and dense [>70%] CC [canopy cover]."

Nesting habitat is primarily dominated by medium (12-24" dbh) to large (>24") trees and multi-storied stands with dense canopy closure (generally >70%) (Verner et al. 1992b, Moen and Gutiérrez 1997, North et al. 2000, Blakesley 2003, Blakesley et al. 2005). Nests can be found in side cavities of live and dead firs and pines, in the top of broken-topped trees and snags, in platform nests which naturally exist in branching structures or which were built by another species, or in mistletoe brooms (Gutiérrez et al. 1992, Blakesley et al. 2005). Blakesley et al. (2005) found the mean diameter of nest trees on the Lassen study area was 46" dbh, with over 90% of nests in >30" dbh trees. Large remnant trees (>30"), even if they occur at low density (<0.5/acre), appear important to serve as nest trees (Blakesley 2003, Blakesley et al. 2005). Large trees typically provide tall, dense, canopies with open understories, suitable nesting cavities, and structural complexity, which benefits prey species for foraging and nesting. Bond et al. (2004) found the number of large trees (>30") and higher canopy cover to be the most important habitat variables in defining nesting habitat.

Foraging habitat includes mid- to late-seral forest with at least 40-50% canopy closure (Verner et al. 1992b). Irwin et al. (2007) found optimal foraging habitat consisted of moderately-dense forest with basal area from 152 to 240 ft^2/acre in Douglas-fir, white fir, and red fir, and greater basal area of large (>8" dbh) hardwoods. Daytime roosts are typically in denser forests with greater basal area and overstory canopy cover than for nocturnal roosts (Irwin et al. 2007).

Spotted owl populations exhibit high adult survival (>80%) but highly variable reproduction and recruitment (Blakesley et al. 2001, Seamans 2005, Blakesley et al. 2006a). The spotted owl population growth rate appears to be most dependent on adult survival (Lande 1988, Noon and Biles 1990, Blakesley et al. 2001, Seamans 2005, Blakesley et al. 2006a). A meta-analysis of the ongoing demography studies in 2010 found no significant decline of spotted owls in the Sierra Nevada, but acknowledged the risk of thinning in the Wildland Urban Interface to habitat quality, as well as the limitations of vegetation data to accurately assess the effects of habitat changes to owls (Blakesley et al 2010). A portion of the American River Ranger District is within a long-term demography study, which recently concluded that over the course of 20 years California spotted owl occupancy declined 31% and the population declined 50% (Tempel 2014).

While adult survival is the most important variable to the population growth rate, annual variability in the population growth rate is influenced by reproductive output and juvenile survival (Seamans 2005). There is a high level of annual variation in the proportion of pairs that nest, and a high level of annual variation in nesting success (Noon and Biles 1990, Verner et al. 1992, North et al. 2000, Blakesley et al. 2001, USDA Forest Service 2009). Blakesley et al. (2005) found that nest success was higher when large remnant trees (>30") were present in the nest stand, and higher in nest stands dominated by medium sized trees (12-24") than in stands dominated by large trees (>24").

Nesting attempts and nesting success appear to be connected to abiotic environmental factors, especially the weather (North et al. 2000, Lee and Irwin 2005, Seamans 2005, USDA Forest Service 2009). In the southern Sierra Nevada, North et al. (2000) noted that within any given year in the southern Sierra Nevada reproductive success was largely synchronous among all owl pairs, negatively correlated with nesting period precipitation in oak woodlands and conifer forest, and positively correlated with April's minimum temperature in conifer forests. Reproductive output was also correlated with high levels of foliage volumes over the nest, suggesting this provides protection from precipitation (North et al. 2000). Seamans (2005) modeled demographic parameters of 15 years of data on the Eldorado study area, and found that the top model suggested that reproductive output was negatively correlated with cold and wet conditions during incubation. LaHaye et al. (2004) found that fecundity was lower during wet spring seasons, and increased with increasing precipitation during the previous year. Prey availability, also subject to the effects of weather, can have major effects on general owl biology such as reproductive rates, timing and location of nesting, whether nesting occurs, density of nesting pairs, and dispersal or major movements of whole populations (Verner et al. 1992b).

California spotted owls have strong site fidelity and establish a strong pair bond (Blakesley et al. 2006b). They do not stay together, however, during the non-nesting season (Verner et al. 1992b). They exhibit individual variation in migratory behavior; in the non-nesting season any particular owl may migrate to lower elevations, stay in the same general area used during the nesting season, or move back and forth between areas (Verner et al. 1992b). Spotted owls use similar habitats in the nesting and non-nesting seasons (Irwin et al. 2007). Approximately 7% of adult California spotted owls change territories during the non-breeding season; these movement generally consists of younger owls, single owls, paired owls that lost their mates, owls at lower quality sites, and owls that failed to reproduce in the prior year (Blakesley et al. 2006b).

The northern flying squirrel (*Glaucomys sabrinus*) and dusky-footed woodrat (*Neotoma fuscipes*) comprise the two primary prey species of the California spotted owl, with the flying squirrel the predominate prey in the higher elevation conifer forest and the woodrat the predominate prey in the lower elevation forests and woodlands (Williams et al. 1992, Munton et al. 2002, USDA Forest Service 2009). Pocket gophers (*Thomomys* spp.) were the second largest component (in biomass) of owl diets on Sierra National Forest in both the higher conifer-dominated elevations and the lower woodland elevations (Munton et al. 2002). Other prey items are other small mammals (especially *Peromyscus* spp.), birds, lizards, and insects (Munton et al. 2002, USDA Forest Service 2009).

Northern flying squirrels in the Sierra Nevada are associated with black oak and mixed-conifer forests, and are typically found above 3,000 feet elevation (Williams et al. 1992). In the southern Sierra Nevada (Meyer et al. 2005) and in Yosemite National Park (Meyer et al. 2007a), flying squirrels have been found to use multiple nests per month; snags are preferentially selected for nesting but live trees are also used, and they tend to be the largest available. Red fir is the preferred species for flying squirrel nesting; in the absence of red fir there is no tree species preference except perhaps selection against incense cedar (Meyer et al. 2005a, Meyer et al. 2007a). Canopy cover has not been found to be an important habitat variable for flying squirrels (Meyer et al. 2005a, Meyer et al. 2007a). Occupancy and nesting has been found to be correlated with proximity to perennial creeks where more xeric conditions exist in the southern Sierra Nevada (Meyer et al. 2005a), but this relationship was not found in the wetter conditions of Yosemite National Park (Meyer et al. 2007a). Large diameter downed woody material and forest litter plays a role in production of truffles which are primary summer food sources for the northern flying squirrel and white-footed mouse, another important prey species of the spotted owl (Verner et al. 1992b). A higher amount of litter depth, and residual litter depth following prescribed burning, was important to flying squirrel presence, possibly due to a greater abundance of truffles (Meyer et al. 2007b). The winter diet of the flying squirrel is composed primarily of arboreal lichens (Verner et al. 1992b).

Dusky-footed woodrats are associated with oak woodlands, mixed-conifer, and pine-cedar forests containing a hardwood component, and occur generally below approximately 5,000 feet elevation in the Sierra Nevada (Williams et al. 1992, Coppeto et al. 2006). Their daily activities are centered around houses they construct out of vegetative material generally on the ground, but sometimes in trees (Williams et al. 1992, Innes et al. 2008). Tree houses are generally in cavities of California black oak and snags, but are also found on limbs especially those of understory white fir (Innes et al. 2008). They eat foliage and acorns, and their diet may be locally specialized to only a few of the available plant species and can be dominated by incense cedar in mixed-conifer forest (McEachern et al. 2006). Dusky-footed woodrat abundance has been found to be positively associated with shrub density (Lee and Tietje 2005).

Risk factors for the California spotted owl include loss of habitat, habitat fragmentation, reduction in habitat quality, climate change, the effects of wildfire, disturbance at breeding sites, the invasive barred owl, disease, and blood parasites (USDA Forest Service 2001a, Vol. 3, pp. 69-112, Ishak et al. 2008, USDA Forest Service 2009).

The invasive and larger barred owl poses a threat to the California spotted owl due to competition for food and nesting resources, possible displacement, hybridization with the spotted owl, and potentially increased spread of disease and blood parasites (Ishak et al. 2008, USDA Forest Service 2009). Beginning around the late 1800s, the barred owl expanded its range from the forests east of the Great Plains to forests in the western United States, arriving in northern California around the late 1970s from Oregon, and in the Sierra Nevada in the 1980s where they have continued to increase in abundance though at a slower rate than their expansion in Washington and Oregon (Livezey 2009, USDA Forest Service 2009). The barred owl is more of a habitat generalist than the spotted owl, occupying a greater variety of habitats and having a wider range of prey than the spotted owl (Livezey 2007, Livezey et al. 2008). There is one known barred owl territory on the Yuba River Ranger District on the Tahoe National Forest which has existed since the early 1980s. Surveys in 2016 detected a barred owl and a hybrid spotted / barred owl (sparred) near the Sunny South project area.

Disturbance to California spotted owls is another potential risk factor. Wasser et al. (1997) measured significantly higher levels of stress hormones in male northern spotted owls whose home range centers were within 0.41 km (0.25 mi.) of major logging roads or recent (10 years to present) timber activity. Hayward et al. (2011) found that northern spotted owls that nested near noisy roads fledged fewer young then those exposed to less noise, indicating that noise exposure may effect reproductive success. Forest Service recommendations for reducing direct effects to spotted owls have generally included minimizing disturbances within 0.25 miles of known roosts or nests during the breeding season (March 1 through August 15).

In 2006 the USFWS (USFWS 2006; 71 FR 29886) finding that the California spotted owl did not warrant listing fully evaluated the latest meta-analysis (Blakesley et al. 2006) and found there are "… more positive indications of population trends for spotted owls of the Sierra than did the older analysis…"(page 29893), and determined that "The best-available data indicate that California spotted owl populations are stationary throughout the Sierra …In fact, there was no strong evidence for decreasing linear trends in the finite rate of population growth (lambda) on any of the four Sierra Nevada study areas …" (page 29907). The USFWS was again petitioned to list the California spotted owl in 2015 and issued a 90-day finding on September 17, 2015 that found the petition contained information to warrant a more in-depth review of the species' conservation status.

The Tahoe National Forest includes one of the nine geographic areas of concern identified in the CASPO report (Beck and Gould 1992). This area of concern approximately incorporates the middle third of the forest, and was identified because the checkerboard pattern of public and private lands increases the uncertainty that owl habitat would be maintained across ownerships (Beck and Gould 1992). When combined with the natural habitat fragmentation of the higher elevation territories by rock outcrops and the resulting relatively low spotted owl density, landscape-scale habitat fragmentation could occur from east to west. This increases the risk to owl populations if the owl's status in the Sierra Nevada deteriorates (Beck and Gould 1992).

A recent analysis of the nearby Eldorado study area population concluded that California spotted owl occupancy declined 31% and the population declined 50% between 1990 and 2012 (Tempel 2014). An analysis of the effects of forest management on California spotted owls using data from the same study concluded that reductions in canopy cover in dense stands (>70% canopy cover) from either logging or wildfire may be contributing to the study population decline (Tempel et al. 2014). Tempel et al. (2014) noted that fuels treatments can have a negative effect on habitat quality in the short term but the benefit of reducing long-term wildfire risk must be considered and additional research is needed to determine the trade-offs. That study noted that the actual effect of f medium-intensity timber harvests on reproduction was only weakly supported (ibid.).

The Eldorado study area includes 37% private lands, including industrial timber lands and a growing residential component. Vegetation management projects on private lands do not include the same protections for wildlife that exist on public lands. Although demographic studies can detect population declines, and loss of habitat is considered a likely cause, these studies were not designed to identify causes. The SNAMP team did consider various vegetation treatments and the risk of fire.

Region 5 of the Forest Service released interim recommendations for managing California spotted owls on National Forest lands in August 2015 as part of a lawsuit settlement. The interim guidelines require the development of an alternative to timber projects that provides additional habitat protection and analysis amongst 4 management zones around Activity Centers. These recommendations are interim because a team is developing a Conservation Assessment of the current state of the science of California spotted owls to update the Assessment published in 1992 (Verner et al) and a Conservation Strategy recommending long-term management direction.

Lee and Irwin (2005) examined the potential long-term effects to California spotted owl occupancy and reproduction by landscape-level reductions in canopy cover through various combinations of mechanical forest thinning and wildland fire through six decades. They modeled various long-term scenarios of no treatment, light thinning with prescribed fire, heavy mechanical thinning, mixed-lethal fire (6 foot flame lengths), and lethal fire within spotted owl territories. The light and heavy thinning prescriptions were modeled to leave the larger trees regardless of species. Three categories of spotted owl territories were examined over a projected six decade time period, representing territories with a higher proportion of sparse canopy cover (non-reproductive territories), territories with an intermediate mix of canopy cover classes, and territories with a larger proportion of dense canopy cover. Lee and Irwin (2005) state:

> "The general trend for all scenarios except immediate lethal fire was towards higher proportions of intermediate canopy cover (40-69%) and lower proportions of sparse canopy cover (0-39%). The mechanical thinning and mechanical thinning plus DFPZ construction scenarios resulted in less of the dense canopy class (70-100%), but equal or more amounts of intermediate canopy levels than the let-grow scenario through time. Mixed-lethal fire produced a pronounced effect in the decade that the simulated fire occurred (the second decade), which was still discernible 4 decades later. None of the simulated trajectories moved beyond the range of observed variation in the original data, suggesting that expected effects on owl reproduction would be essentially immeasurable. Our simulation results lend credence to the hypothesis that modest fuels treatments are compatible with territory-level canopy cover needs for spotted owl reproduction in the Sierra Nevada."

Lee and Irwin (2005) note that their analysis of fire effects was simplified when compared to the complex fire behavior characteristics of most landscapes, and that all potentially complex habitat elements important to spotted owls were not analyzed. They specify that the entire complex of factors affecting owls should be considered when designing and implementing thinning projects in order to minimize risk to spotted owls.

Bond et al. (2008) found that a mosaic of burn severities in a wildfire, like that which occurred in the McNally Fire on Sequoia National Forest in 2002, through previously established California spotted owl territories has been found to maintain spotted owls in the area for at least four years post-fire. The McNally Fire of 2002 burned with variable severity creating a mosaic across the landscape; of the conifer forest within the fire perimeter, 31% remained unburned, 29% burned at low severity, 27% burned at moderate severity, and 13% burned at high severity (Bond et al. 2008). In their study, low severity burned areas were preferentially selected for roost sites, and high severity burned areas were preferentially selected for foraging over unburned sites (Bond et al. 2008). Preferential use of the burned areas for foraging in this mosaic may be due to the increased shrub and forb understory, and accompanying increased prey availability as a result (Lee and Tietje 2005, Innes et al. 2007, Bond et al. 2008).

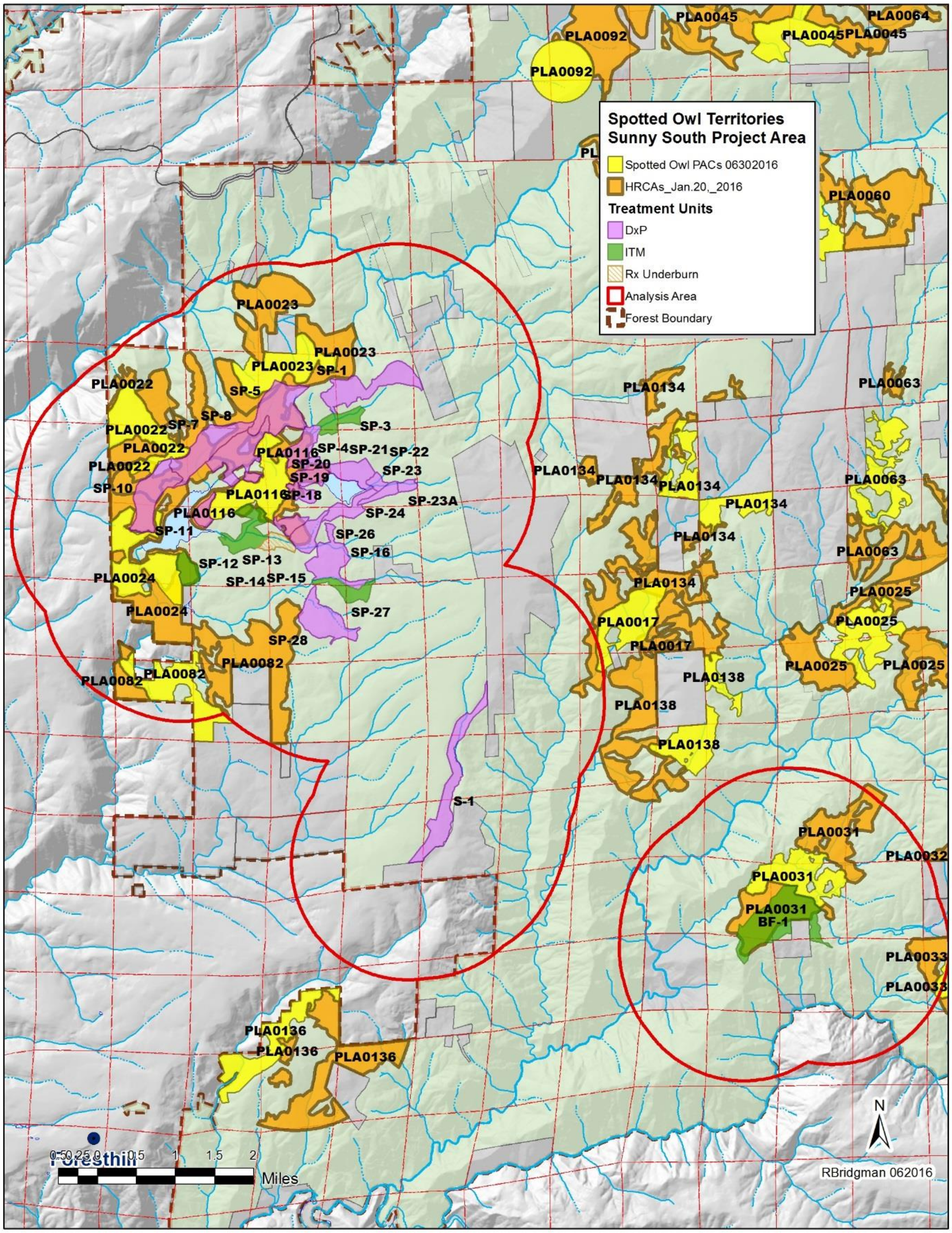
The spatial extent of the analysis area for the California spotted owl (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities (Fig.1), to encompass adjacent territories and habitat that spotted owl might use, but not so large as to potentially mask effects on spotted owl habitat from the Sunny South Project. CWHR forest vegetation types and strata and canopy cover are the primary metrics used for the California spotted owl in this analysis, although some of the available LiDAR data is also used because it is more current and accurate. CWHR is useful in modeling predicted changes in pre-and post-treatment stand density and size classes in relation to habitat suitability for wildlife species such as the California spotted owl.

An estimated 17,962 acres of moderate to high capability nesting habitat (conifer dominated stands of size classes 4, 5, and 6 with a density of M or D) occurs in the analysis area, which amounts to approximately 47% of the total area. Based on these numbers, it appears that much of the analysis area and the proposed treatment units provide suitable habitat for spotted owls. However, some of the units and much of the analysis area consists of Volcano plantations and other managed areas, including the Seed Orchard, portions of which appear to provide suitable habitat for spotted owls. In reality, these areas contain few or no large trees, which is a key habitat characteristic for this species. These areas are also limited in snags, large downed wood, and consist of essentially a single story, limiting habitat complexity and cover for spotted owls and prey species. This is true of portions of many units and particularly characterizes units S-1, SP10, and SP-28.

Surveys conducted for the Sunny South project follow the Pacific Southwest Region Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas (USDA Forest Service, March 12, 1991, revised February 1993). Two-year protocol surveys, complementing ongoing Sierra Nevada Owl demography surveys, were initiated for this project in 2016. The results of the long-term (20+ year history) spotted owl survey effort, project-specific surveys, and relevant surveys from other sources such as spotted owl biogeographic data from the California Department of Fish and Wildlife (formerly CDFG), are considered in this analysis. Only known territories were confirmed during survey efforts and results of these detections are summarized in Table 13. Additional surveys will be completed during the 2017 breeding season and any new spotted owl detections and confirmed nesting would result in project modifications to comply with management requirements (e.g. limited operating periods and limits to project activities within PACs/ HRCAs).

There are currently 48 California spotted owl PACs and HRCAs on the American River Ranger District. California spotted owl PACs are delineated to include the best available 300 acres of nesting habitat and HRCAs are delineated to include the best available 1,000 acres of nesting, roosting, and foraging habitat as described in the Forest Plan. Eight spotted owl PACs and HRCAs are mapped in or partially within 1.5 miles of the project (Figure 2). Only portions of spotted owl PACs and HRCAs within 1.5 miles of the project are included in subsequent habitat analyses (e.g. estimated changes in quantity of habitat expected).

Figure 3. California spotted owl PACs and HRCAs within 1.5 miles of the Sunny South project



Six spotted owl PACs and a small portion of two others (PLA0017 and PLA0033) are within 1.5 miles of the Sunny South project (the analysis area). The PACs were delineated to include all the historic nest sites and many other detections such as roosts and foraging areas. Some of these PACs are adjacent to proposed treatment units but none of the proposed units include treatments in the PACs. Based on surveys in 2016 the boundary of PLA0024 was revised to include a new roost area. Unit SP-12 was reduced to allow for the revision to the boundary of PLA0024.

The quadratic mean diameter (QMD) of trees in the PACs, the mean canopy cover, and the concentration of large trees, as derived from available LiDAR data, are shown in Table 7. These values can be compared to those from Table 5, which listed values for proposed treatment units, and have a lower mean QMD, canopy cover, and density of large trees. This is not surprising, because owls select stands with higher values than average, and PACs are delineated to include the largest trees and densest canopy. The activity centers (nests/ roosts) for the PACs tend to be in the highest densities of large trees in the PACs, which themselves contain some of the highest densities of large trees in the analysis area. The QMD and canopy cover values were not calculated for the entire analysis area because it would be skewed by the inclusion of non-forested areas. Large tree densities are shown in Figure 4, but excludes the Big Oak Flat area (Unit BF-1), because the preliminary LiDAR data available did not include that area.

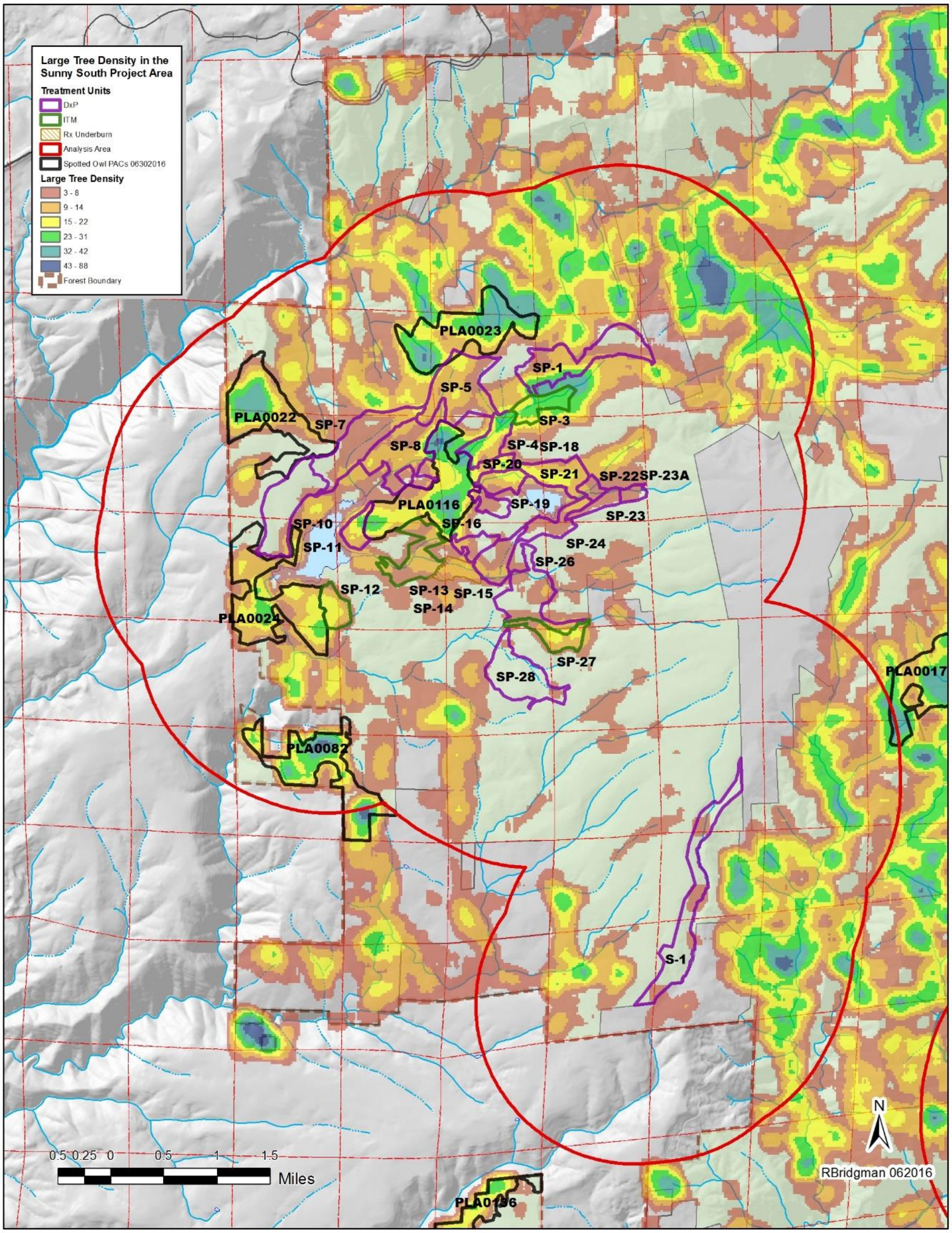
Table 7. Existing canopy cover and QMD in California spotted owl PACs within 1.5 miles of the Sunny South project.

Protected Activity Center	QMD	Mean Canopy Cover	Large Trees (>30”dbh)/ acre
PLA0017	25.3	89.5	25
PLA0022	22.6	87.3	15
PLA0023	27.8	92.3	25
PLA0024	22.9	86.3	11.9
PLA0082	25.5	89.7	20
PLA0116	25.3	83.4	22

Note: data derived from preliminary LiDAR data that excluded the Last Chance project area that was part of the SNAMP research project, thus PAC PLA0031 and PAC PLA0033 are not included here.

Spotted owl home range core areas (HRCAs) consist of 1,000 acres of the best available habitat for spotted owls, and include the 300-acre PACs. The HRCA outside the PACs also includes most of the other owl detections, such as roosts or foraging areas. Approximately 4,363 acres of 8 spotted owl HRCAs are within 1.5 miles of the Sunny South project, which is 78% of the total acres in these HRCAs (outside the PACs). The proposed treatment units include 1,174 acres of the HRCAs in the analysis area, which is about 21% of the total acres in these HRCAs. If the PACs are included in the HRCAs, the project units would only affect about 15% of the total acreage associated with the territories in the analysis area.

Figure 4. Large Tree Density in the Sunny South Project Area



The history of the spotted owl territories in the analysis area are shown below (Table 8). The likely contribution of each PAC to spotted owl productivity is estimated using the method described in the Forest Plan, as amended by the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (USDA USFS 2004). Although included here, very little of spotted owl HRCAs PLA0017 and PLA0033 and their corresponding PACs are within the analysis area. It should be noted that all the territories that would be directly affected a consistently occupied and frequently breed, contributing substantially to productivity.

Table 8. Summary information for California spotted owl PACs and/or HRCAs within the analysis area.

PAC	Territory Occupancy; No surveys listed as Unk (unknown)							
	PLA0017	**PLA0022**	**PLA0023**	**PLA0024**	**PLA0031**	**PLA0033**	**PLA0082**	**PLA00116**
2006	Unk[1]	Unk	Pair	Pair	Unk	Unk	Unk	Single
2007	Unk	Unk	Nest (fail)	Nest	Nest	No Detection	Nest	Single
2008	Unk	Unk	Pair	Pair	Nest	Single	Nest	Pair
2009	Unk	Pair	Nest (fail)	Nest	Nest	Pair	Pair	Pair
2010	Single	Pair	Nest (fail)	Nest	Nest (fail)	Pair	Pair	Pair
2011	Unk	Pair	Pair	Single	Pair	Pair	Nest	Pair
2012	Nest	Nest	Pair	Unk	Pair	Pair	Nest	Nest
2013	Pair	Pair	Pair	Pair	Pair	Pair	Nest	Pair
2014	Pair	Nest	Nest (fail)	Pair	Unk	Unk	Nest	Nest
2015	Unk	Pair	Nest	Unk	Nest	Single	Nest	Pair
2016	Unk	Pair	Pair	Pair	Unk	Unk	Single	Nest
Contribution to Productivity[2]	5	5	5	5	5	4	5	5
Acres Proposed Treatment in HRCA	0	201	14	182	245	0	0	530

[1] Unk= Unknown; surveys incomplete or not conducted. [2]Contribution to productivity: 1) PACs presently unoccupied and historically occupied by territorial singles only; 2) PACs presently unoccupied and historically occupied by pairs; 3) PACs presently occupied by territorial singles; 4) PACs presently occupied by pairs; and 5) PACs currently or historically reproductive.

B. Effects of the Proposed Action

Direct Effects – Project Related Disturbance

The proposed action has the potential to cause direct, disturbance to individual birds where timber harvest, burning, or other activities occur near roost or nesting sites. Disturbance at nests and roosts is a concern because it can result in nest predation and/ or abandonment. The four PACs near Sugar Pine Reservoir and the one PAC at Big Oak Flat are particularly at risk because units are adjacent to the territories; nonetheless, recent surveys suggest the nests in PAC PLA0024, PLA0116 and PLA0031 are the only sites within ¼-mile of proposed treatment areas. The other activity centers in the analysis area are over ½-mile from proposed project areas and are not expected to be adversely affected by mechanical disturbance. As part of the project design, limited operating periods (LOPs) would be implemented in and adjacent to the spotted owl activity centers to prevent disturbance to breeding birds. Foraging birds in the HRCAs are not expected to suffer disturbance because timber activities occur during the day. Similarly, owls are likely to roost in areas near the nest stands inside the PACs, so would also benefit from the ¼-mile buffer during the breeding season. If activity centers change prior to implementation, the area protected by the LOP would be moved. No nest stands would be treated under the proposed actions and no activities would occur within ¼-mile of active nest stands during the breeding season.

An exception to the LOP may be applied for prescribed fire in the spring, which may cause some disturbance associated with chainsaw work and smoke; however, these activities would be relatively brief, limited to 1-2 days. Disturbance to spotted owls may occur outside of the breeding season, but aside from potential temporary displacement, this disturbance is not expected to result in substantial adverse effects. While unlikely, if spotted owls are detected in or adjacent to project units during the breeding period, LOPs would be applied, as needed, therefore project-related disturbance to this species is expected to be minimal.

Road use and actions associated with the project may result in disturbance to spotted owls, but would be limited by LOPs and the existing distance to nest stands for most territories. Because of the proximity of PLA0116 to roads and units, an additional LOP was included to limit hauling on adjacent roads during the breeding season. Several paved roads are located within the boundary of PLA0024, and hauling may result in disturbance to this territory. This road already receives major use, because it provides access to the recreational sites on the north side of the lake, access to the dam and facilities used by the public utilities district, and access to private land to nearby private land.

Indirect Effects – Habitat Quality and Quantity

Although much of the acreage in the units and the surrounding analysis area meet the CWHR criteria for moderate to high quality spotted owl habitat, this is a conservative assumption in many areas, particularly the plantations. As described above in Existing Conditions, the plantations are 40-50 years old pine stands, with little diversity, and little or no snags, logs, or hardwoods, which are important constituents of spotted owl habitat. Both the plantations and other stands within the project units have been thinned as part of later projects, including the SSO and Big Reservoir projects, both of which included commercial thinning. Forest Service crews are surveying these areas to determine if owls are using them, but it appears unlikely that many of the areas the meet the CWHR criteria for moderate to high quality habitat outside the existing PACs would support nesting pairs. Nonetheless, as shown in Figure 4, there are areas that contain high densities of large trees outside the designated PACs that may support nesting, foraging, or dispersing owls.

Table 9 below lists treatments proposed within designated HRCAs and within moderate to high quality potential habitat for spotted owls. Commercial thinning would reduce canopy cover on a total of 1,874 acres of potentially suitable habitat, which makes up about 11% of the potentially suitable habitat in the analysis area. The 1,174 acres of HRCA that are in treatment areas make up about 27% of the HRCA in the overall analysis area. Table 10 identifies the specific units that occur in HRCA and the proposed thinning levels.

The mixed conifer stands contain higher quality, more diverse habitat than the plantations, which is why very little of the HRCAs are located in plantations. The plantations consist largely of dense ponderosa pine, which does not normally occur in dense single-species conditions. Along with the plantations, many of the mixed conifer stands have received past treatments, and contain limited habitat value for spotted owls, despite meeting the CWHR definition of moderate to high quality habitat. The reduction in canopy cover and basal area in these areas would nonetheless result in higher resilience and growth rates.

Table 9. Acres of treatments occurring within designated HRCA and within potentially suitable California spotted owl habitat.

<table>
<tr><th>Treatment</th><th>PAC ID</th><th>Acres in HRCA/ %</th><th>Acres in Suitable Habitat</th></tr>
<tr><td>Commercial Thinning,
Prescribed Burning.</td><td>PLA0022
PLA0023
PLA0024
PLA0031
PLA0116</td><td>201/ 41
14/ 2
144/ 21
245/ 35
530/ 76</td><td>1,874</td></tr>
<tr><td>Prescribed Burning only</td><td></td><td>0</td><td>38</td></tr>
<tr><td>Total</td><td></td><td>1,174</td><td>1,936</td></tr>
</table>

Table 10. Treatment units and proposed thinning in HRCAs.

<table>
<tr><th>Unit</th><th>Plantation/ Mixed Conifer</th><th>Acres</th><th>In HRCA</th><th>Existing/ Target Canopy Cover</th><th>Target Basal Area</th></tr>
<tr><td>BF-1</td><td>Mixed Conifer</td><td>314.9</td><td>Y</td><td>66/50</td><td>120</td></tr>
<tr><td>S-1</td><td>Plantation</td><td>219.2</td><td>N</td><td>70/40</td><td>100</td></tr>
<tr><td>SP-1</td><td>Plantation/ Mixed Conifer</td><td>194.7</td><td>N</td><td>54/40</td><td>100</td></tr>
<tr><td>SP-3</td><td>Mixed Conifer</td><td>65.3</td><td>N</td><td>81/40</td><td>100</td></tr>
<tr><td>SP-4</td><td>Mixed Conifer/ Plantation</td><td>79.0</td><td>Y</td><td>80/50</td><td>120</td></tr>
<tr><td>SP-5</td><td>Mixed Conifer/ Plantation</td><td>196.6</td><td>Y</td><td>75/50</td><td>120</td></tr>
<tr><td>SP-7</td><td>Mixed Conifer</td><td>181.6</td><td>Y</td><td>73/50</td><td>120</td></tr>
<tr><td>SP-8</td><td>Mixed Conifer</td><td>186.8</td><td>Y</td><td>74/50</td><td>120</td></tr>
<tr><td>SP-10</td><td>Mixed Conifer/ Plantation</td><td>176.2</td><td>Y</td><td>64/50</td><td>120</td></tr>
<tr><td>SP-11</td><td>Mixed Conifer</td><td>41.1</td><td>Y</td><td>82/50</td><td>120</td></tr>
<tr><td>SP-12</td><td>Mixed Conifer</td><td>55</td><td>Y</td><td>84/50</td><td>160</td></tr>
<tr><td>SP-13</td><td>Mixed Conifer</td><td>118.3</td><td>Y</td><td>69/50</td><td>100</td></tr>
<tr><td>SP-14</td><td>Mixed Conifer</td><td>43.4</td><td>N</td><td>73/73</td><td>NH</td></tr>
<tr><td>SP-15</td><td>Mixed Conifer/ Plantation</td><td>75.2</td><td>Y</td><td>72/50</td><td>120</td></tr>
<tr><td>SP-16</td><td>Plantation</td><td>39.1</td><td>Y</td><td>78/50</td><td>120</td></tr>
<tr><td>SP-18</td><td>Mixed Conifer /Plantation</td><td>36.6</td><td>Y</td><td>78/50</td><td>120</td></tr>
<tr><td>SP-19</td><td>Mixed Conifer /Plantation</td><td>50.8</td><td>Y</td><td>86/50</td><td>120</td></tr>
<tr><td>SP-20</td><td>Mixed Conifer</td><td>20.5</td><td>Y</td><td>77/50</td><td>100</td></tr>
<tr><td>SP-21</td><td>Plantation</td><td>91.6</td><td>N</td><td>65/40</td><td>100</td></tr>
<tr><td>SP-22</td><td>Plantation</td><td>22.6</td><td>N</td><td>59/40</td><td>100</td></tr>
<tr><td>SP-23</td><td>Plantation</td><td>32.1</td><td rowspan="2">N</td><td rowspan="2">74/40</td><td rowspan="2">100</td></tr>
<tr><td>SP-23A</td><td>Plantation</td><td>20.3</td></tr>
<tr><td>SP-24</td><td>Plantation</td><td>65.3</td><td>N</td><td>58/40</td><td>100</td></tr>
<tr><td>SP-26</td><td>Plantation</td><td>151.9</td><td>N</td><td>66/40</td><td>100</td></tr>
<tr><td>SP-27</td><td>Mixed Conifer</td><td>64.3</td><td>N</td><td>83/40</td><td>160</td></tr>
<tr><td>SP-28</td><td>Plantation</td><td>156.9</td><td>N</td><td>63/40</td><td>100</td></tr>
<tr><td colspan="2">Total</td><td>2,700</td><td></td><td></td><td></td></tr>
</table>

HRCAs

The best habitat for spotted owls in the analysis area is generally within the designated PACs and the HRCAs, which do not generally include much in acreage in the largely pine plantations. The PACs would not be treated. As shown in Table 9, only 14 acres (2%) of HRCA would be treated in PAC PLA0023, whereas substantial portions of the other HRCAs would be affected, particularly in PLA0116, which includes 76% of the HRCA. The treatments in the HRCAs would reduce habitat value by reducing canopy cover to about 50%, but would retain a higher canopy cover and basal area than units outside the HRCAs. Canopy cover in these units would be reduced by an average of 34% and based on FVS modelling, the stands would recover about 79% of the existing canopy cover in 20 years. As described above, about 27% of the HRCA in the analysis area would be affected. In practical terms, the best spotted owl habitat was designated in the PACs, whereas the HRCA outside the PACs consists of the best available additional habitat and other owl detections, where possible. Because the HRCA are managed to retain more canopy cover than general forest, the treatments would reduce habitat quality, but these areas would likely recover quicker and provide more habitat value to owls than the areas outside the HRCAs, which is important for dispersing juveniles, for owls in winter when they may need to travel further to forage, and for connectivity with adjacent PACs. The existing HRCAs provide very good connectivity between the PACs in the Sugar Pine area.

Suitable Habitat

The units that do not overlap HRCAs would nonetheless affect 1,898 acres of moderate to high quality habitat for spotted owls in the project area. Canopy cover and thus habitat value in these units would be reduced by an average of 41% and based on FVS modelling, the stands would recover 78% of existing canopy cover in 20 years. Outside the project area, in the surrounding analysis area, 89% of the moderate to high quality suitable habitat would not be treated, including in the PACs. As described above, much of this untreated area is fragmented and lacking in large trees, but there are some larger areas associated with the headwaters of Shirttail Creek in the northwestern portion of the analysis area and the southeastern portion associated with roadless areas in Eldorado Canyon and the North Fork of the Middle Fork American River. The thinning in suitable habitat outside the HRCAs would generally benefit the continued development of these stands, without affecting known territories, but would temporarily reduce habitat quality and connectivity to other areas. The habitat suitability of the affected stands would be reduced with the loss of canopy cover, but suitable stands would still have average tree size and canopy cover to qualify as moderate habitat quality, as well as a sufficient level of snags and logs compared to the existing condition. The thinning is expected to improve the stand trajectory to enable the continued survival of the stand and increase the rate of growth in developing larger, mature trees.

Within individual units outside the HRCA, the areas that contain greater stand complexity and larger trees are typically associated with drainages, particularly Forbes and Shirttail Creeks. Some of these drainages occur amongst the plantations, where the Volcano Fire may have burned at lower intensity. Except in a few instances where approved by a hydrologist and a fishery biologist, these areas would be protected as riparian conservation areas (RCAs; see project Management Requirements) and receive little or no treatment, retaining complexity and canopy cover in these areas.

Unit BF-1 at Big Oak Flat is located atop the flat, adjacent to several residences on private property. The unit is largely within a portion of the HRCA for the associated PAC and has been subject to extensive use by the neighboring properties, particularly illegal woodcutting of some of the large oaks. As shown in Figure 2, the site narrowly escaped several large wildfires that occurred in the last 20 years. The owls in this area have occurred almost entirely within ¼-mile of the current activity center in the PAC near Peavine Creek, north of the proposed treatment area. Big Oak Flat contains numerous large black oaks, as the name suggests, which are being crowded by conifers. The area was commercially thinned in the early 1980s, about 35 years ago. The largest conifers are along the slope breaks dropping down to Peavine Creek, which is why the spotted owl PAC is located in these areas. Most of the moderate to high quality spotted owl habitat is located in the northeastern portion of the analysis area. The HRCA for the PAC PLA0031 in Big Oak Flat would only be treated on the southern end, which does not provide connectivity to adjacent PACs; this unit is on the edge of the river canyon which burned in the Ralston Fire. Treatment in this HRCA would not affect connectivity to adjacent areas, nor would it affect the Peavine Creek area where most of the owl activity occurs.

The interim recommendations for spotted owls were not applied to this project, however the areas within the approximately 1,000-acre territorial circle around the activity centers were considered. The suitable areas within these circles include 554 acres with moderate to high quality spotted owl habitat, most of which overlaps the HRCAs. The activity centers in PACs PLA0022, PLA0023, and PLA0024 are located at the far end of the PACs, away from treatment areas; most of the affected suitable habitat within the territorial circles are near PACs PLA0116 and PLA0031 (435 acres). As described above, these areas vary in quality, but the treatments would retain suitable habitat by retaining 40-50% canopy cover, the largest trees, and a level of snags that is likely higher than when the bug-kill began.

These 1,000-acre territorial circles, while important in terms of contiguousness and proximity to the activity centers, are artificial constructs that do not necessarily reflect the availability of the largest, most structurally complex stands or their relationship to the terrain, which is invariably shaped by drainages. Tempel et al (2015) looked at the effect of thinning in these 1,000-acres areas in the nearby Last Chance study area, although they assumed treatments would reduce canopy cover to 40%, whereas areas in both that project and Sunny South require maintaining canopy cover in HRCAs at 50%, which results in better habitat retention in the HRCAs and more rapid recovery to 70% or more. Even after treatment, the core roosting and nesting habitat in the 300- acre PACs would retain very high canopy cover, as would streamside buffers, which provide important refugia from high summer temperatures.

The PACs and HRCAs were specifically designed to respond to owl use and habitat availability. PAC boundaries are periodically reviewed in response to changes in habitat, project planning, and owl detections. If areas in addition to the PACs were set aside, there would certainly be more suitable habitat available for spotted owls, but the project units were selected based on the risk to the stand, either because of existing bug-killed pockets of dead trees or because the stands appear to be unsustainably dense. Indeed, there is some risk in not treating in the PACs, which are generally dense with large trees that are at risk of drought and insects. Although owls will use dead stands, they also rely on dense overstory that is lost with extensive bug kill. Thinning suitable habitat for spotted owls, while having an adverse effect, would not directly affect the PACs and would allow the continued development of the stands with additional resources for remaining trees in the form of space, light, and water. Berigan et al (2012) considered the value of PACs in long-term occupancy, by comparing the designated PACs to actual usage by owls. They found that the PACs were similar in size to core habitat use, that the PACs captured the majority of daytime roosts, and that PACs were remained occupied by spotted owls. This study did not look at year-round habitat use or the extent of foraging at night, but spotted owls are known to be less restrictive in habitat choices for these uses. Because the HRCAs are managed for higher canopy cover retention, they provide a kind of “feathering” of the best habitat near the PACs from the surrounding general forest.

All of the units would be subjected to prescribed fire. Prescribed underburning and pile burning would generally occur during periods suitable for burning during the fall when early season rainfall has occurred or spring when the material has dried sufficiently to support ignition. The risk of escaped burn piles is relatively low; the risk associated with broadcast underburning is higher because it occurs over a larger area and may encounter dense fuels or reach into the tree canopy. Protective fire-lines would be placed around burn piles and underburn units to control the extent. In the event that fire escapes or the intensity is greater than planned, active suppression would be used to stop the spread of the fire and to minimize the impact to the surrounding area. The risk of injuring or killing owls during these activities is relatively low, as the initial human disturbance and ongoing, slow ignition will flush animals from the area; however there is a somewhat increased risk of road mortalities, and animals may be injured if flushed from roosts or nests.

The project areas are at relatively low elevations (generally at or below snowline) and near heavy human recreational and residential use, and thus are at relatively high risk of wildfire. Although spotted owls will use burned habitat, particularly for foraging, and although burned areas provide other biologically valuable habitat components, such as snags and logs, these areas are typically logged for residual timber value and rapidly lose habitat value for spotted owls due to loss of canopy cover, either from logging or from eventual decay and collapse of snags. Large green forest can take a century or more to develop sufficient habitat complexity for spotted owls. The proposed thinning and prescribed burning is expected to reduce the spread of bug-kill and allow for suppression activities that may allow for lessened fire severity in the PACs.

Because most units would be thinned prior to burning, both human disturbance and effects to the stands would likely be greater in these areas. The thinning would reduce the stand density and break up the continuity of surface fuels, which is expected to result in lower flame lengths and intensity during burning. Nonetheless, the effects of thinning and burning are expected to result in some, perhaps substantial, reduction in logs, snags, and tree densities that, like the proposed thinning, may reduce habitat values for spotted owls for 20 to 50 years. Burning may also contribute to the creation of logs and snags, cavities, and provide other important ecological benefits related to nutrient cycling and disease control.

Visibility and accessibility for spotted owls hunting in the understory would be improved slightly with prescribed burning, but a more open understory may reduce habitat quality for some spotted owl prey species over the short term and revert toward pre-treatment levels over the subsequent 20 years. Opening the understory would contribute to thinning to slightly reduce the risk of high severity wildfire and associated adverse long-term effects to spotted owl habitat. Prescribed burning would have negligible effects on canopy layering, average dominant and co-dominant tree diameter, tree canopy closure, and the presence of some very large snags. Prescribed burning would reduce down woody debris, particularly in smaller size classes, over the short term. Trees suitable for perching, nesting, or as day or night roosts are unlikely to be affected and large trees, which are an important component of spotted owl habitat, would be protected during prescribed burning by clearing duff and vegetation from around their boles. The overall effect of prescribed burning would be slightly reduced habitat quality in the short term with expected long-term benefits to habitat quantity and quality.

The ongoing increase in snags from bug-kill and proposed removal of snags adversely affects habitat for spotted owls, which utilize them for both nesting and prey habitat. The project would retain some snags, but an unknown number of snags would be lost during operations such as skidding or landing construction, during prescribed burning, and as part of hazard tree removal. Snag and large tree retention would maintain these important habitat components for northern flying squirrels (a primary prey species for spotted owl). Removal of understory trees and shrubs would have a mixed effect on spotted owl prey (e.g. foraging cover for flying squirrels would be reduced yet conditions for the fungi they feed on would be improved) and would likely result in minor, complex and dynamic effects (e.g. altering patterns of availability) for the remainder of the analysis period. Additional snags would continue to be recruited from ongoing bug-kill and prescribed burning is likely to create new snags in addition to consuming existing snags and logs. The removal of hazard trees would expand the effects of the road corridors, further fragmenting habitat for snag and log-associated species. Overall, the project would result in an adverse loss of snags, but is expected to help lessen the loss of large green trees, which would retain canopy cover compared to continued spread of bug-kill.

One of the benefits of the commercial thinning and removal of insect-killed trees is the intention to retain and enhance tree species diversity. The current dense stands of pine in the plantations provide limited habitat value; thinning these areas where they contain hardwoods or other conifer species will increase their relative presence in the stands and increase the likelihood of long-term retention and recruitment of these species. Enhancing species diversity is expected to increase the resilience of these stands to various stressors such as drought and disease and will provide more habitat niches for prey species such as woodrats and flying squirrels.

The treatments associated with the two rust resistant sugar pines are both in potentially suitable habitat for spotted owls, but are not in PACs or HRCA or within a 1,000-acre circle around an activity center. These opening would be relatively small, but would greatly reduce the density and habitat suitability around these trees. The effect to spotted owl habitat would be limited due to the limited number of acres affected.

The proposed project is not expected to change the probability of barred owl expansion into the analysis area; this species can occupy more habitats and has invaded both suitable and unsuitable habitat, while outcompeting spotted owls. The retention of large trees and snags is expected to maintain this important habitat characteristic for spotted owls but would likely benefit barred owls as well, providing structural complexity for nesting, foraging, and roosting. Barred owls also utilize a more diverse prey base than spotted owls and are less sensitive to changes in prey species community composition.

As research has shown, fuels and thinning treatments adversely affect habitat quality for spotted owls, but there is nonetheless some value in treatment when faced with wildfire (Tempel 2014). The Sunny South project areas are relatively low elevation, in designated WUI threat and defense zones, and receive heavy human use, suggesting a very high potential for wildfire. In all the treatment areas, important characteristics such as downed wood, snags, and large trees would largely be retained, while smaller ladder fuels and midstory trees would be thinned commercially or during prescribed burning. The expected result is to reduce the density and dominance of ponderosa pines in the plantations, which are overstocked at unsustainable levels, to provide more space to increase the growth and resilience of retained trees in plantations and mixed conifer stands, and to provide space around hardwoods, which provide important habitat value to many wildlife species. The pockets of trees killed by insects will provide some snags and logs, but thinning will help buffer the occupied spotted owl PACs from fire and mortality spread. Given the areas' history of fire and intense management, the current habitat quality in single age, dense ponderosa pine plantations in the Sugar Pine area, and the known history of the PACs and habitat use by owls, the adverse effects to habitat quality and individual territories anticipated under the proposed action are generally outweighed by the benefits.

Cumulative Effects

The cumulative effects analysis area for California spotted owl extends 1.5 miles (38,189 acres) beyond the maximum spatial extent of proposed project activities to encompass habitat this species might use, but not so large as to potentially mask the effects of the proposed Sunny South Project. The analysis area is defined to extend 20 years before and after the present in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the Analysis Area have been completed on a total footprint of approximately 12,441 acres. Most vegetation management on federal lands within the analysis area in the past 20 years has been conducted utilizing uneven-aged prescriptions under either the CASPO Interim Guidelines (adopted in 1993) or amended Forest Plan standards and guidelines (beginning in 2001). These commercial thinning prescriptions tended to be some version of a "thinning from below," prescription, designed to remove understory trees in the suppressed and intermediate canopy classes and some co-dominant trees while retaining overstory trees, canopy cover, and the largest trees in the treated stands. While the CASPO Interim Guidelines allowed the removal of canopy closure below 40 percent in some thinned stands, this was a minor component of the overall thinning acreage.

Most of the commercial thinning in suitable habitat on Forest Service lands has been conducted under current Forest Plan standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in the largest trees outside of HRCAs, while higher retention occurs in HRCAs and PACs. Adherence to this management direction resulted in thinning treatments that temporarily reduced habitat quality by reducing canopy closure and snag recruitment and increasing fine scale fragmentation with temporary roads and landings, but generally maintained existing habitat, and increased the likelihood of long term resilience by reducing the risk of adverse effects to habitat from high severity wildland fire. Some of the treatments occurred in the Volcano Fire plantations, which required ongoing thinning as the stand grows, along with past bug-kill and commercial thinning projects. Past treatments affects approximately 1,439 acres of vegetation treatment in the HRCAs in the analysis areas, including both fuels treatments and commercial thinning.

Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (6,080 acres), private timber harvest (2,700 acres), and seed tree cut (555 acres) reduced spotted owl habitat quality and quantity by reducing canopy cover below the level considered suitable. Altogether, private land makes up 26% of the analysis area, and includes large areas of unsuitable habitat for spotted owls. The private inholdings in the area vary in size, but contribute to the disturbance, fragmentation, and limited connectivity of suitable habitat.

Wildfires have occurred over approximately 3,640 acres (10%) of the analysis area over the last 20 years. Spotted owl habitat that burned at high severity will still support owls temporarily, but the more open condition is rendered unsuitable for nesting and roosting. Salvage timber harvest occurred over portions of the 2006 Ralston Fire and 2013 American Fire, but relatively little occurred within the cumulative analysis area. While largely outside the analysis area, it should be noted that the Government Fire, American Complex, American Fire, Star Fire, and King Fire were very large fires in the surrounding landscape that reduced habitat suitability, greatly fragmented habitat and connectivity between territories in the middle elevation of the American River Ranger District.

The ongoing bugkill in the area and surrounding landscape is having several wide-ranging results. There is an increase in western pine beetle and other species that benefit from drought-stressed trees, including long-horn beetles (Cerambycids) and flat-headed borers (Buprestids), whose larvae inhabit the dead trees. Carpenter ants also utilize dead and dying trees. These and other insects in turn feed other insectivorous insects, woodpeckers, and insectivorous birds and mammals, including bats. The reduced canopy cover under the dead and dying trees provides more light, water, and nutrients to other plants, including herbs, shrubs, and young trees, including oaks, which do not appear to be dying in any substantial numbers in the area. These other plants also serve various insect specialists, particularly pollinators such as bees, beetles, and butterflies, which provide various ecosystem services and prey for birds and other species. The increased recruitment of logs and large woody debris can help reduce soil erosion, provide cover and movement corridors for small animals, and, along with snags, provide nesting, roosting, and escape cover for cavity-associated birds and animals. In general, the loss of canopy is expected to reduce habitat values for spotted owls, whereas an increase in productivity and prey species is likely a benefit; these effects are similar to those described in post-fire studies. An increase in snags and logs is probably beneficial for owls, but at a certain point, the long-term loss of large trees is a substantial adverse effect. The proposed project is intended to try to balance these costs and benefits.

The ongoing management of the Seed Orchard (430 acres) leaves these stands open, small-sized, subject to regular management disturbance, and unsuitable habitat for spotted owls. This area, combined with Foresthill Divide Road, and private lands to the east and west, limits habitat connectivity and opportunities for dispersal between the Sugar Pine area and other PACs and suitable habitat elsewhere.

Present and reasonably foreseeable future actions occurring within the Analysis Area include the Biggie and Cuckoo Fuel Reduction and Vegetation Management Projects and occur within a 3,000-acre footprint. The general effects of the Biggie and Cuckoo project are expected to result in various degrees of short-term habitat change at the patch-scale, but overall project design standards were to maintain suitable habitat for the spotted owl at the stand and landscape scale. Canopy cover reductions under both projects are expected to reduce habitat quality but maintain habitat suitability, much like the Sunny South project. These projects also include pre-commercial thinning and fuels treatments, resulting in more open and homogeneous understory conditions in the short term that likely have had localized impacts to prey species including some small mammals and songbirds by reducing or eliminating cover. Like the Sunny South project, these projects would include little or no treatment in the PACs, limited treatment in parts of the HRCAs, and important thinning treatments in a particularly fire-prone area. Cuckoo and Biggie are on the edge of the Middle Fork American River, and contain some of the last unburned areas between the Ralston, American, and Star Fires.

Grazing continues in the Big Oak Flat area, affecting understory vegetation and associated prey habitat and providing human management activities and associated disturbance. Grazing may have a slight adverse effect on spotted owls, although the grazing allotment is currently proposed for changes that would reduce adverse effects to vegetation and wildlife use.

In addition to camping and boating, the Sugar Pine area receives relatively heavy OHV use on a system of designated trails. Most of these trails do not directly affect spotted owl PACs, except for PAC PLA0118 contains about 2 miles of OHV trails. Trails also affect suitable habitat and areas in associated HRCAs. Vehicular traffic can adversely affect spotted owls, although this PAC is regularly reproductively active. There is currently a planned project to reroute several miles of trails where they are causing ongoing soil damage and erosion, including portions within the analysis area. These proposed changes are located outside of PACs and HRCAs, but occur in potentially suitable habitat for spotted owls. The planned changes are not expected to increase OHV use or substantially adversely affect spotted owls.

There is a great deal of current concern about human-induced climate change. While the exact effects, particularly at localized scales, are difficult to anticipate, some general effects may be described for the range and habitat types of many Sierran habitats (Safford 2006). Mallek et al examined the historic data for temperatures, snowpack, precipitation, habitat, and species occurrences over time in the Sierra with a focus on the Tahoe and Eldorado National Forests (2012). Climate models suggest that hardwood densities will increase in montane forests (ibid.). Fires are expected to become more frequent and more intense (Cayan et al 2006; Battles et al 2006; Mallek et al 2012). Some studies suggest the mid-elevation portions of the western Sierra Nevada will be subjected to more burned area in the next few decades (Mallek et al 2012). Higher fire activity will adversely affect important habitat components such as large tree densities and canopy cover. Fires also increase snag and surface woody debris in the short term (5-20 years), but increased frequencies of fire ultimately reduce these important habitat components over the long term because large trees are not available to recruit new snags and logs over time. In addition, productivity of conifers in a warmer climate, particularly pines, would be greatly reduced, slowing recovery of forest habitats (ibid.). Fuels reduction projects have been shown to have measurable effects on wildfire behavior and spread (Safford et al 2009).

The Point Reyes Bird Observatory reviewed the existing science on climate change and applied it to wildlife in specific regions of California (PRBO 2011). They identified the following as threats to Sierra Nevada wildlife from climate change:

1. Changes to vegetation communities, including increases in the amount of grassland and oak/pine vegetation, and a loss of conifer dominated vegetation, particularly those habitats occurring at higher elevations. Increased fire severity and frequency is expected to facilitate this vegetation trajectory.
2. Increased temperatures are not expected to be a substantial direct stressor to wildlife species, except for those that may have limited temperature tolerance or at lower, foothill areas, where temperatures are already very high during the summer.
3. Rivers and streams will typically have less water and dry earlier in the season due to reduced snowmass, which may reduce and degrade riparian and wet meadow habitats and reduce productivity.
4. Earlier peak streamflows, which will change the timing that many native species have adapted to in terms of water availability, insect hatches, egg-laying, and other life history needs.

The general effect of climate change at the lower elevations includes reduced conifer densities, which would reduce habitat values for mature conifer-dependent species such as spotted owl, northern goshawk, and fisher. Meadow, shrub, and oak woodland species may benefit from the anticipated changes in forest structure. Metabolic impacts of warming climates on wildlife, their prey, and the vegetation that they utilize for habitat and forage are likely, but unknown, but may have profound effects as well (Safford 2006). Because interactions between various factors that make up a species' niche are complicated and synergistic, it is not possible to make precise predictions of climate change impacts, nor is it possible to exhaustively list all the effects (ibid.).

Overall past, present, and reasonably foreseeable future projects on forest land would cumulatively maintain spotted owl habitat by limiting treatments in PACs, reducing fuels accumulations increasing resilience while limiting canopy cover reduction and retaining snags and logs where available in surrounding conifer forest. In addition, all actions proposed by the TNF and permitted activities are considered both in regard to effects to suitable habitat and in regard to potential for disturbance to activity centers. If activities would lead toward unacceptable disturbance, an LOP is applied, as needed. While the level of activity and the acres affected in the analysis area is high, most of these activities have been associated with improving stand conditions in the face of ongoing and increasing stressors such as yearly and periodic drought, fire, and climate change. These actions produce tradeoffs in habitat quality, but are thought to provide the best opportunities to maintain or develop mature forest habitat conditions for spotted owls. The proposed project would have similar effects as recent projects on forest land and would maintain California spotted owl suitability but would reduce habitat quality in the short term.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the California spotted owl.

Rationale:

- Habitat suitability would be retained.
- Important habitat attributes would be retained (large snags and down woody material).
- Limited operating periods would reduce the risk of project-related disturbance to nesting spotted owls.
- Habitat quality would be reduced in the short term but would benefit spotted owls in the long term by reducing the risk of adverse effects from insect-kill, drought, and climate change.

GREAT GRAY OWL

A. Existing Environment

The distribution of the great gray owl is circumboreal, with the Sierra Nevada encompassing the most southern extent of the species (Beck and Winter 2000). The core range of the great gray owl in California is centered on the greater Yosemite National Park area (Winter 1986, Greene 1995, Beck and Winter 2000, Sears 2006). There are records of great gray owls as far south as Tulare County, and to the north from the Modoc, Lassen, Plumas, Tahoe, and Eldorado National Forests, and from Del Norte, Humboldt, Shasta, and Siskiyou Counties (Beck and Winter 2000).

Current knowledge on great gray owl distribution and habitat requirements is somewhat limited, in part because research and surveys are difficult due to the wary and elusive behavior of the species (Sears 2006, Rognan 2007). Winter (1986) estimated the population in the greater Yosemite area at 73 birds in 1984, and Greene (1995) estimated over 100 birds (of all age classes) in the same area. Sears (2006) estimated 123 individuals throughout the Sierra Nevada based upon surveys to the northern and southern extent of their expected distribution and accounting for the previous estimates for the Yosemite area.

In the Sierra Nevada, great gray owls require two particular habitat components; a meadow system with a sufficient prey base, and adjoining forest with adequate cover and nesting structures (Winter 1980, Winter 1986, Greene 1995, van Riper and van Wagtendonk 2006). Meadows appear to be the most important foraging habitat for great gray owls, where approximately 93% of their prey is taken (Winter 1981). Data from the greater

Yosemite area suggests that to support persistent occupancy and reproduction, meadows need to be at least 25 acres, but meadows as small as 10 acres may support infrequent breeding (Winter 1986, Beck and Winter 2000). Using radio telemetry, van Riper and van Wagtendonk (2006) found that over 60% of all great gray owl locations were within 100 meters (328 feet) of a meadow; 80% of locations were within 200 meters (656 feet) of a meadow. Nesting great gray owls in the western Sierra Nevada may also be associated with openings other than meadows such as cleared areas for development, open oak savannah, and timber clear-cuts (Amanda Shufelberger, Sierra Pacific Industries, personal communication). Great gray owls have also been documented in northeastern Oregon foraging in open forest, clear-cuts, and burned areas where these areas support a high cover (eg. mean 88% in forest with canopy cover 11-59%) grass-forb habitat (Bull and Henjum 1990). In comparing number of large snags (>24" dbh), smaller snags (<24" dbh), and canopy cover, Greene (1995) found that high canopy cover was the only variable significantly higher in occupied habitat, possibly due to its effect on microclimate.

In the Sierra Nevada, great gray owl breeding activity is generally found in mixed coniferous forest from 2,500 to 8,000 feet elevation where such forests occur in combination with meadows or other vegetated openings (Greene 1995, Beck and Winter 2000). In their study in Yosemite National Park, van Riper and van Wagtendonk (2006) found that home ranges were located adjacent to meadows in red fir and Sierra mixed conifer most frequently, and home range boundaries followed meadow and drainage topography. They found that most females nested where red fir was the most common habitat type, and some nested in habitat dominated by lodgepole pine (van Riper and van Wagtendonk 2006). Habitat types used by breeding females included Sierra mixed conifer, montane riparian, and montane chaparral types (van Riper and van Wagtendonk 2006). Nesting usually occurs within 840 feet (averaging 500 feet) of the forest edge and adjacent open foraging habitat (Beck and Winter 2000). Greene (1995) found that nest sites had greater canopy closure (mean 84%) and were more likely located on northern aspects than expected by chance.

As with most owls, great gray owls do not build their nests (Bull and Henjum 1990, Greene 1995). In contrast to northeastern Oregon and elsewhere where platforms such as old hawk nests and mistletoe infected limbs are the predominant nest substrate (Bull and Henjum 1990), most nests in the Sierra Nevada have generally been found at the top of large broken top fir snags; fir snags tend to break at right angles and form a suitable nest substrate (Winter 1986, Greene 1995). Greene (1995) found that the next most preferred species for nesting was black oak, found at the lower elevations. Greene (1995) found that nest trees in Stanislaus National Forest averaged 32 inches dbh and 32 feet tall, while those in Yosemite National Park averaged 44 inches dbh and 45 feet tall. In northeastern Oregon, Bull and Henjum (1990) found that great gray owls readily used artificial open platforms, preferentially 49 feet high but also 30 feet high if none higher were available, and preferentially in closed forested stands versus those adjacent to clear-cuts.

In the Yosemite area, males begin establishing nesting territories in March to early April (Beck 1985). After 30 to 36 days of incubation, eggs hatch from mid-May to mid-June. Young begin to fledge in early June to early July, but will remain around the nest through August. However, great gray owls will breed earlier at higher elevations (approximately 2 weeks earlier for every 1,000 foot increase in elevation).

In Yosemite National Park, van Riper and van Wagtendonk (2006) found breeding season home ranges (95% adaptive kernel) averaged 152 acres for females and 49 acres for males. Breeding adults were found to utilize specific activity centers within the home range, with radio telemetry locations densely packed in localized areas; the activity centers averaged 43 acres (based on the 75% adaptive kernel home range). Activity centers were based around nests or roost sites but also included nearby foraging areas, and were frequently associated with outer meadow boundaries (van Riper and van Wagtendonk 2006). While much larger than breeding season home ranges, non-breeding season home ranges were also centered on wet meadows (van Riper and van Wagtendonk 2006). During the non-breeding season, home ranges averaged 6,072 acres for females and 5,221 acres for males (van Riper and van Wagtendonk 2006).

Great gray owls hunt by perching at the edges of meadows or grasslands and listening for prey in grass runways or underground burrows, then flying low over the ground and dropping on the prey (Brunton 1971, Nero 1969, Winter 1981). During the majority of the breeding season, males do a majority of the hunting, often by day, and provide food to the nest (Greene 1995). Larger trees possibly have more open limb development, allowing stooping and less view obstruction. Winter (1982) also observed owls using fence posts as hunting perches. Greene (1995) found that hunting perches were generally located in drier microsites. The lack of perches at the edges and/or within meadows may render a meadow unsuitable for great gray owls.

Prey of great gray owls is primarily pocket gophers and voles (Winter 1986, Reid 1989, Bull et al. 1989). If prey numbers are low in any given year, great gray owls may occupy a site but may not nest, possibly due to the lack of ability to feed young (Bull and Henjum 1990). Greene (1995) found that occupied and reproductive great gray owl habitat corresponded more closely to greater vole than greater gopher abundance; his results suggested that gophers are generally more abundant than voles, but they are probably less available to great gray owls due to the fact they are typically underground. Pocket gophers tend to inhabit areas of deep unsaturated soils allowing for easier burrowing and tunneling (Jones and Baxter 2004), while voles tend to inhabit wet meadows with thick grass, forbs, and sedge cover (Sera and Early 2003). As increased soil moisture improves habitat for voles, it becomes less suitable as gopher habitat; in combination with typically drier conditions observed at hunting perch sites, Greene (1995) suggested that variability in soil moisture and related vegetation conditions, to support the two primary prey taxa, may provide optimal great gray owl foraging habitat in the Sierra Nevada.

In the Tahoe National Forest, there have been few recorded great gray owl sightings, and nesting has only recently been confirmed in one location on or near private land. Possible sighting and/or detection locations include Kyburz Flat (2009 single individual, nesting not confirmed), near Independence Lake (2012 a pair was detected but nesting not confirmed) Perazzo Meadows (May 2004 nesting not confirmed), along Pliocene Ridge Road (occasional sightings since 2003 with confirmed nesting in the area in 2009), three miles north of Nevada City (an adult located in January 1996 and January 1997), Donner Ranch Ski Area (pair observed in November 1994), near Spencer Lakes at the northern border of the Tahoe National Forest (detection in July 1990), south of Lincoln Creek Campground (an individual in July 1987), and near Sattley (pair in January 1985).

Great gray owls are not known to occur in the analysis area but surveys have not been conducted. The closest known detection was near Round Mountain (Northeast of Nevada City) approximately 14.7 miles from the analysis area. Suitable nesting habitat adjacent to meadows of at least 10 acres only occurs within the analysis area at Elliot Meadow. This meadow is nearly 16 acres and directly adjacent to unit SP-1. Habitat adjacent to openings other than meadows is also considered potentially suitable nesting habitat and this habitat also occurs within the analysis area. Nesting habitat in this analysis is defined as forest with canopy cover in the CWHR category D (60-100% canopy cover) or M (40-59% canopy cover) and tree size 5 and 6 (>24” dbh). Openings that could potentially be capable foraging habitat are common throughout the analysis area due to private timber harvest, natural openings, and multiple wildfires occurring within the last 20 years.

B. Effects

Direct and Indirect Effects

Direct effects to great gray owl generally are not expected; however, a slight chance of disturbance-type effects (e.g. flushing a perched individual) exists in association with project activities such as felling trees, prescribed burning, or the operation of heavy equipment. Disturbance-type effects, if they occur, are expected to be brief (e.g. causing an individual to fly out of the immediate vicinity of the disturbance) and slightly negative (e.g. causing a temporary change in habitat use).

The proposed action has the potential to reduce great gray owl habitat by removing large insect infested trees. Large trees and snags would be retained within project units where possible. Additionally, reducing stand density would free up resources for larger trees to develop. The proposed action would not reduce great gray owl habitat suitability. Indirect effects to great gray owl habitat are expected as project activities improve stand conditions (e.g. increasing resources available to large trees), and reduce the potential for adverse effects from tree pathogens or a high severity wildfire. These indirect effects are expected to be slight, beneficial, and long term as treated stands mature. No change is expected in the quantity of nesting, roosting, or foraging habitats available immediately following implementation of the proposed action due to proposed treatments retaining large trees outside of insect infested areas, retaining all snags except when determined to be a hazard to the road, and not reducing overall canopy cover below 40%. Road decompaction may improve habitat slightly in the long-term by improving stand continuity and reducing human disturbance.

Cumulative Effects

To assess how the effects of the Sunny South Insect Treatment Project proposed action could incrementally add to the effects of past, present, and future actions, great gray owl habitat was assessed within 1.5 miles of the treatment units.

Specific past, present, and reasonably foreseeable future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS) lands within the analysis area have been completed on a total footprint of approximately 12,441 acres. Recent past activities have mainly retained large snags/trees that would provide preferred nesting and roosting sites, though during past hazard tree removal and fire salvage projects potentially suitable nesting and roosting trees have been removed. Removal of large snags during hazard tree removal or fire salvage has reduced the quality of nesting habitat by reducing the number of potential nest sites, though large snags remain available throughout the analysis area. Past treatments such as group selection, overstory removal, fire salvage, and wildfires have likely had a beneficial effect to great gray owls by creating openings which provide potentially suitable foraging and nesting habitat. Past projects would not add to the level of direct effects as the projects have been completed and will not add to any disturbance type effects of the proposed project or future projects.

The proposed action would contribute to a small reduction in large diameter trees/snags that could be used for nesting or roosting through the removal of trees that are determined a safety hazard near roads and large trees that show signs of insect infestation or are within the buffer around infestation patches. The other present and reasonably foreseeable future vegetation actions would have the same effects as discussed for the proposed action. Disturbance type effects resulting from the proposed action are expected to add minimally to disturbance caused by the other projects as a minimal overlap in project implementation activities may occur.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the great gray owl.

Rationale:

- Habitat suitability would be retained.
- No known nest sites occur within the project or analysis area.
- There is a slight chance of disturbance to individual great gray owls during project implementation.
- Threats to great gray owl or their habitats would be reduced (e.g. risk of wildland fire).

NORTHERN GOSHAWK

A. Existing Environment

The northern goshawk (*Accipiter gentilis)* is listed on the USFS R5 Sensitive Species List for the Tahoe National Forest. In 1997 the northern goshawk was petitioned for listing as threatened or endangered west of the 100th meridian, but upon status review the USFWS found it did not warrant listing (USFWS 1998; 63 FR 35183).

As prescribed by the Forest Plan, surveys are conducted in compliance with the Pacific Southwest Region’s survey protocols during the planning process when vegetation treatments are likely to reduce habitat quality are proposed in suitable northern goshawk nesting habitat that is not within an existing California spotted owl or northern goshawk PAC (USDA Forest Service 2000).

Standards and guidelines for northern goshawk management are defined in the Forest Plan, as amended. Current guidelines include delineation of protected activity centers (PACs) surrounding all known and newly discovered breeding territories detected on National Forest System lands. Northern goshawk PACs are designated based upon the latest documented nest site and location(s) of alternate nests. If the actual nest site is not located, the PAC is designated based on the location of territorial adult birds or recently fledged juvenile goshawks during the fledgling dependency period (USDA Forest Service 2004).

Northern goshawk PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 200 acres of forested habitat in the largest contiguous patches possible, based on aerial photography. Where suitable nesting habitat occurs in small patches, PACs are defined as multiple blocks in the largest best available patches within 0.5 miles of one another. Best available forested stands for PACs have the following characteristics: (1) trees in the dominant and co-dominant crown classes average 24 inches dbh or greater; (2) in westside conifer and eastside mixed conifer forest types, stands have at least 70 percent tree canopy cover; and (3) in eastside pine forest types, stands have at least 60 percent tree canopy cover. Non-forest vegetation (such as brush and meadows) should not be counted as part of the 200 acres. As additional nest location and habitat data become available, PAC boundaries are reviewed and adjusted as necessary to better include known and suspected nest stands and to encompass the best available 200 acres of forested habitat. When activities are planned adjacent to non-national forest lands, available databases are checked for the presence of nearby northern goshawk activity centers on non-national forest lands. A 200-acre circular area, centered on the activity center, is delineated. Any part of the circular 200-acre area that lies on national forest lands is designated and managed as a northern goshawk PAC. PACs are maintained regardless of northern goshawk occupancy status. PACs may be removed from the network after a stand-replacing event if the habitat has been rendered unsuitable and there are no opportunities for re-mapping the PAC nearby.

In 1999, prior to PAC-delineation guidelines set forth in the 2001 and 2004 SNFPA, 64 Goshawk Management Areas had been identified in Tahoe National Forest based on known nest sites, territorial adults, and habitat suitability. In June 2003, the Tahoe National Forest reviewed existing Goshawk Management Area boundaries to ensure that they met the intent of the SNFPA 2001 direction for goshawk PACs. By June 2003 PAC delineation had been completed in Tahoe National Forest in accordance with SNFPA direction. At that time there were 71 northern goshawk PACs encompassing approximately 15,500 acres. Since then, additional PACs have been delineated based on new information, and as of 2014 there are 137 goshawk PACs in the Tahoe National Forest encompassing 29,427 acres.

The Northern Goshawk Scientific Committee was established in 1990 to develop a credible management strategy to conserve the goshawk in the southwestern United States. Reynolds et al. (1992) recommendations included that goshawk nesting home ranges should exist as an interspersed mosaic of various structural stages in certain proportions, and that on every acre within home ranges there should remain a few large trees in clumps that live out their lives and eventually become snags, then logs that decompose. Their recommendations focused on three components of a goshawk's nesting home range, amounting to about 6,000 acres: nest area (approximately 30 acres), post fledging-family area (PFA; approximately 420 acres), and foraging area (approximately 5,400 acres; Reynolds et al. 1992). The nest area may include more than one nest, is typically located on a northerly aspect in a drainage or canyon, and is often near a stream (Reynolds et al. 1992). Nest areas contain one or more stands of large, old trees with a dense canopy cover (Reynolds et al. 1992).

Forest types associated with goshawk nest areas vary geographically (USFWS 1998, Kennedy 2003). In the Sierra Nevada goshawks breed from the mixed conifer forests at low elevations up to and including high elevation lodge pole pine forests and eastside ponderosa pine habitats. Goshawks winter from the lodgepole pine forest down slope to blue oak savannah (Verner and Boss 1980). In the Tahoe National Forest, goshawks are year-round residents. Nests are found in all of the vegetation types listed above, as well as in aspen stands (Tahoe 1999). Andersen et al. (2005), in review of existing research on goshawks including their nesting habitat and typical high canopy closure preferences, noted that high canopy closure in relation to the range of available canopy closure may be more important for goshawk nesting than absolute canopy closure, at least above some minimum threshold.

Studies suggest that goshawks select more mature forest for nesting, with higher canopy cover and larger trees as compared to surrounding forest (e.g. Hayward and Escano 1989, Squires and Rugiero 1996, Daw and DeStefano 2001). Hypotheses for why goshawks select forest with larger trees and higher canopy cover include: 1) increased protection from predators, 2) increased food availability, 3) reduced exposure to cold temperatures and precipitation during the energetically stressful pre-egg laying period, 4) reduced exposure to high temperatures during the nestling period, 5) reduced competition with raptor species that nest in more open habitats, or 6) increased mobility because of reduced understory vegetation in mature stands (Andersen et al. 2005). Mature coniferous, mixed, and deciduous forest habitats provide large trees for nesting, a closed canopy for protection and thermal cover, and open spaces allowing maneuverability below the canopy (Fowler 1988). Analysis of vegetative data collected at 39 nest sites in the Tahoe National Forest and the Lake Tahoe Basin Management Unit indicates that goshawk nest stands in the Tahoe National Forest have a mean canopy closure of 70 percent, 32 large trees per acre (24-49 inch dbh), large amounts of dead and down logs, and slopes less than 15 percent. Research conducted on the Klamath National Forest indicated that when nest occupancy was monitored over subsequent years, re-occupancy of the nest stand was nearly 100 percent for nest clusters that were maintained at a minimum of 200 acres (Woodbridge and Dietrich 1994).

Recommendations in the Southwest Region suggest managing 5,400 acres of foraging habitat per territory (Reynolds et al. 1992). Conclusions from studies in the Sierra Nevada support similar habitat requirements (Hargis et al 1994, Keane and Morrison 1994). Important components of foraging habitat include snags (min. 3/ac. >18" dbh) and logs (min. 5/ac. >12" dbh and > 8' long) for prey base populations (USDA 1991). Management requirements for the California spotted owl are thought to provide adequate quantities of snags and down logs to support goshawk prey species in foraging habitat (Tahoe 1999). Beier and Drennan (1997) found that goshawks selected foraging sites that had higher canopy closure, greater tree density, and greater density of trees greater than 16 inches in diameter. They recommend managing stands for canopy closure values above the prescribed minimum 40%. Primary prey species include small mammals and small to medium sized birds (Verner and Boss 1980, Fowler 1988).

Goshawk nesting activities are initiated in February. Nest construction, egg laying and incubation occur through May and early June. Young birds hatch in June and begin fledging in late June and early July, and are independent by mid-September.

Potential risk factors to goshawks include effects of vegetation management and wildfire on the amount, distribution, and quality of habitat (USDA Forest Service Pacific Southwest Region 2001a). Human disturbance is also a risk factor. In the Lake Tahoe Basin Management Unit, Morrison et al. (2011) found that human activity was twice as high within infrequently as compared to frequently occupied goshawk territories, and there was a greater extent of all types of roads and trails within the infrequently occupied territories. While it is not statistically significant, Grubb et al. (1998) noted no discernible change in behavior to logging truck noise as they passed at 500 meters from two active goshawk nests. A more recent study looked at disturbance from logging trucks driving by at 78, 143, and 167 meters, which resulted in no flushing of nesting goshawks.

Moser and Garton (2009) experimentally tested the effects of clearcutting within goshawk nesting areas on reoccupancy and nesting success for two years following treatments, and found no effects on goshawk reoccupancy, nesting success, or number of fledglings between harvested and unharvested nesting areas. Their model suggested, however, that goshawk breeding area reoccupancy was a function of the amount of potential nesting habitat available in the 17-ha area surrounding the nest, with goshawks reoccupying breeding areas if they contained >39% potential nesting habitat following harvest; and that goshawks were more likely to attempt nesting after disturbance if >39% of the 170-ha (420 acres) area around their nest was left in potential nesting habitat (Moser and Garton 2009). A circular area representing 420 acres would be represented by a radius of approximately 0.4 miles.

The spatial extent of the analysis area for northern goshawk (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities (Figure 3), to encompass habitat that goshawks might use, but not so large as to potentially mask effects on goshawk habitat from the Sunny South Project. CWHR forest vegetation types, strata, and canopy cover are the primary metrics used for the northern goshawk in this analysis, along with the preliminary LiDAR data. CWHR is useful in modeling predicted changes in pre-and post-treatment stand density and size classes in relation to habitat suitability for wildlife species such as the northern goshawk.

The following CWHR types and strata provide moderate to high capability nesting and foraging habitat for this species: Jeffrey Pine, Lodgepole Pine, Montane Hardwood, and Ponderosa Pine (4M, 4D, 5M, and 5D); Montane Hardwood-Conifer, Montane Riparian, Sierran Mixed Conifer, and White Fir (4M, 4D, 5M, 5D, and 6); and Red Fir (5M and 5D). Although goshawks occur in aspen, red fir, and lodgepole, the project area and surrounding analysis area do not contain these habitats. Goshawks will also forage in more open forested habitats, as well as riparian areas. Because these dense forested stands containing large trees is the same habitat used by spotted owls, the description of suitable habitat is similar between the two; however, goshawks are highly territorial and they consistently defend a 1-mile territory around their nest stand, whereas spotted owls can occur in adjacent drainages if they contain sufficient suitable habitat.

An estimated 17,962 acres of moderate to high capability nesting habitat defined only by vegetation type (conifer dominated stands of size classes 4, 5, and 6 with a density of M or D) occurs in the analysis area, which amounts to approximately 47% of the total area. Based on these numbers, it appears that much of the analysis area and the proposed treatment units provide suitable habitat for spotted owls. However, some of the units and much of the analysis area consists of Volcano plantations and other managed areas, including the Seed Orchard, portions of which appear to provide suitable habitat for spotted owls. In reality, these areas contain few or no large trees, which is a key habitat characteristic for this species. These areas are also limited in snags, large downed wood, and consist of essentially a single story, limiting habitat complexity and forage for prey species. This is true of portions of many units and particularly characterizes units S-1, SP-10, and SP-28.

Keane and Gerrard developed a model ranking habitat value for goshawks based on existing vegetation, distance to water, and slope to prioritize survey efforts on the Sierra National Forest (2012). While the model was designed to prioritize survey efforts, it also provides a more refined definition of habitat quality, which also considers slope and distance to water, which are important factors for goshawk habitat. Because vegetation was the most important of the three factors in determining habitat value, it was given a higher weight and thus greater influence in determining the final score. Even using a conservative cutoff, potential goshawk habitat is greatly reduced using this model; the Sunny South analysis area includes about 12,148 acres of moderate to high quality nesting habitat using this model (32%). Within the treatment units, 1,364 acres (50%) can be defined as moderate to high quality nesting habitat. Assuming a 1-mile territory, it appears unlikely that the Big Oak Flat area can support an additional territory within the analysis area; however, the Sugar Pine area may support several additional territories. The best habitat would be areas containing significant densities of large trees and spotted owl PACs, which often have overlapping territories.

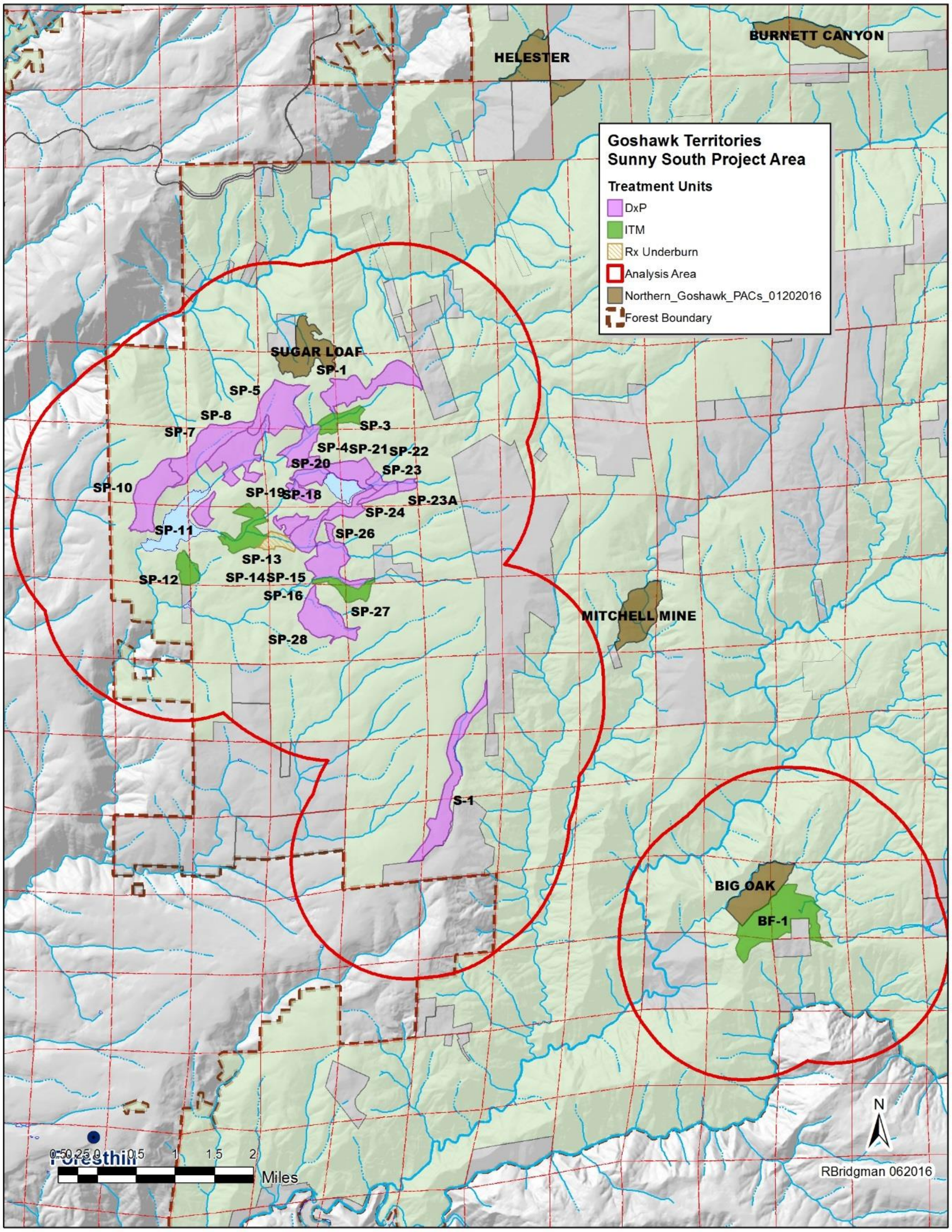
Surveys conducted for the Sunny South project follow regional survey protocols. Two-year protocol surveys for this project began in 2016. Additional surveys will be completed during the 2017 breeding season and any new goshawk detections and confirmed nesting would result in project modification to comply with management requirements (e.g. limited operating periods and limits to project activities within PACs).

Two northern goshawk territories are within the Sunny South Project analysis area and one is just outside, as shown in Figure 5, below. Surveys for the northern goshawk for the Sunny South Project are being conducted in suitable habitat in 2016 and 2017. Historic PAC activity summaries are listed below in Table 11. No other goshawks are documented within the survey area. Vegetation management activities will be subject to an LOP (limited operating period) within ¼-mile of active nests, as described in the project management requirements; any new occurrences outside of existing PACs will receive a surrounding 200-acre PAC of the best available habitat, which may change or eliminate project units.

Table 11. Summary of Occupancy for Northern Goshawk PACs within the Analysis Area.

Protected Activity Center	Occupancy Detected in PAC	Proposed Treatment
Sugar Loaf	Breeding 1995; no recent surveys	None
Mitchell Mine	Breeding 2003; no detections 2014	None
Big Oak	One Adult detected 2013; no detections 2015	Adjacent

Figure 5. Northern goshawk PACs within the Analysis Area of the Sunny South Project.



B. Effects of the Proposed Alternatives

Direct Effects – Project Related Disturbance

The proposed action has the potential to cause direct, disturbance to individual birds where timber harvest, burning, or other activities occur near roost or nesting sites. Disturbance at nests and roosts is a concern because it can result in nest predation and/ or abandonment. The Mitchell Mine PAC is far enough from unit S-1 that adverse disturbance is not expected. The historic nest site in the PAC at Sugar Loaf is at little risk of disturbance, but the PAC at Big Oak Flat is adjacent to the proposed unit. Most of the best habitat in the Big Oak Flat PAC is located at the northwestern side, away from the flat area and the unit; nonetheless there is risk of disturbance if birds are nesting near the project area. As part of the project design, limited operating periods (LOPs) would be implemented in and adjacent to the northern goshawk activity centers to prevent disturbance to breeding birds. No nest stands would be treated under the proposed actions and no activities would occur within ¼-mile of active nest stands during the breeding season. If activity centers change prior to implementation, the area protected by the LOP would be moved. Foraging birds outside of the LOP areas may be temporarily disturbed if near project activities; however, this disturbance is expected to be temporary and is not expected to substantially limited habitat use. Similarly, goshawks are likely to roost in areas near the nest stands inside the PACs, so would also benefit from the ¼-mile buffer during the breeding season.

An exception to the LOP may be applied for prescribed fire in the spring, which may cause some disturbance associated with chainsaw work and smoke; however, these activities would be relatively brief, limited to 1-2 days. These activities would be considered on a case by case basis for needed LOPs. Disturbance to goshawks may occur outside of the breeding season, but aside from potential temporary displacement, this disturbance is not expected to result in substantial adverse effects. If goshawks are detected in or adjacent to project units during the breeding period, LOPs would be applied, as needed, therefore project-related disturbance to this species is expected to be minimal.

Road use and actions associated with the project may create some disturbance to goshawks, but project activities are not expected to substantially increase the use in or within 1/4-mile of the PACs. The existing heavy recreational use in the area, including loud OHV trails and shooting, may limit goshawk use already in the area.

Indirect Effects – Habitat Quantity and Quality

Within the 1,364 acres of moderate to high quality goshawk habitat, commercial thinning would reduce canopy cover to 40% would occur on an estimated 650 acres but would not reduce canopy cover to a level that would reduce habitat suitability for northern goshawk. The remaining 714 acres of treatment in suitable habitat are located in spotted owl HRCAs and canopy cover would be reduced to 50%; stands would change from CWHR D to M, while large trees (all tees greater than 30" dbh and some of the smaller trees), logs, and some snags would be retained. Although snags and understory vegetation would be affected by mechanical harvest activities, the more open understories and openings are expected to increase vegetative diversity, particularly in the plantation units, with more herbaceous and shrub cover, and provide habitat for more rodent and songbird prey species.

As described for spotted owls, the reduction in canopy cover would adversely affect suitable habitat outside the PACs. Reduced canopy cover may adversely affect prey species such as flying squirrel, which feed on fungus that grow on the forest floor, and Douglas squirrels, which feed on pine cones. Reduced canopy can also reduce the temperature moderation of trees, particularly during the extremes of summer and winter. The retention of some canopy would retain many of these values, as well as increase the likelihood of stand resilience to stressors such as drought and fire, and well as increase the growth rate and support the diversity of remaining trees.

The goshawk PACs, spotted owl PACs, and most of the riparian buffers would not be treated, providing denser stands, connectivity, and protected reserves for goshawks if they continue to occupy the designated areas. As described for spotted owls, these areas that would not be treated contain better, more diverse, structurally complex habitat that benefits goshawks. However, the lack of treatment, combined with past and ongoing fire suppression, may put these stands at risk of unsustainable density, of continued spread of insects, and of wildfire. As currently managed, these largely untreated areas provide the highest habitat quality in the analysis area, and increase the value of the surrounding areas, including owl HRCAs and other moderate to high quality goshawk habitat, as foraging habitat, connectivity between territories for dispersal, and as potential future habitat as these areas continue to develop.

Snags and logs are important habitat attributes that support prey species for goshawks. As described in the spotted owl section, the dying trees and resulting snags and logs, while they result in a loss of green forest habitat, provide habitat for numerous other species, and mixed costs and benefits to goshawks. Snags and logs do not provide canopy cover, but they may increase densities of prey, particularly in the relatively sterile and uniform size and age classes found in the plantations. In particular, the bugkilled trees are expected to increase woodpecker densities, which provide large prey for goshawks. The proposed action would reduce the density and recruitment level of snags, but would not reduce the snag level below what is described in the snag retention guidelines. Because of the ongoing bugkill of trees, the thinning is intended to increase the resilience of remaining live trees to prevent the loss of entire stands. Existing snag densities in owl and goshawk PACs and riparian buffers would remain or potentially increase if subjected to continued bugkill. Large woody debris, an important habitat component for the goshawk, generally would remain at the existing levels, or slightly increase across the project area as the bugkilled trees increase. In areas that would experience prescribed burning some large woody debris would be consumed, though an average of at least 5-10 tons per acre is expected to persist and contribute to maintaining suitable habitat for the northern goshawk and their prey.

Prescribed underburning and pile burning would generally occur during periods suitable for burning in the fall or spring when the material has dried sufficiently to support ignition. Covered piles may also be burned in the winter. The risk of escaped burn piles is relatively low; the risk associated with broadcast underburning is higher because it occurs over a larger area and may encounter dense fuels or reach into the tree canopy. Burn plans contain specific weather requirements, as well as protective fire-lines placed around burn piles and underburn units to control the extent. In the event that fire escapes or the intensity is greater than planned, active suppression would be used to stop the spread of the fire and to minimize the impact to the surrounding area. The risk of injuring or killing goshawks during these activities is relatively low, as the initial human disturbance and ongoing, slow ignition will flush animals from the area; however there is a somewhat increased risk of road mortalities, and animals may be injured if flushed from roosts or nests. Known nest stands are typically burned in the fall to reduce risk of disturbance or mortality.

The project areas are at relatively low elevations (generally at or below snowline) and near heavy human recreational and residential use, and thus are at relatively high risk of wildfire. Although goshawks may use burned habitat, particularly for foraging, and although burned areas provide other biologically valuable habitat components, such as snags and logs, these areas are typically logged for residual timber value and rapidly lose habitat value for nesting goshawks due to loss of canopy cover, either from logging or from eventual decay and collapse of snags. Large green forests can take a century or more to develop sufficient habitat complexity for spotted owls. The proposed thinning and prescribed burning is expected to reduce the spread of bug-kill and allow for suppression activities that may allow for lessened fire severity in suitable habitat and designated PACs.

Because most units would be thinned prior to burning, both human disturbance and effects to the stands would likely be greater in these areas. The thinning would reduce the stand density and continuity of surface fuels, resulting in lower flame lengths and intensity during burning. Nonetheless, the effects of thinning and burning are expected to result in some, perhaps substantial, reduction in logs, snags, and tree densities that, like the proposed thinning, may reduce habitat values. Burning may also contribute to the creation of logs and snags, cavities, and provide other important ecological benefits related to nutrient cycling and disease control.

Overall canopy cover, tree size class, snag density, and large woody debris after treatment would be maintained at a level that would retain moderate to high quality northern goshawk habitat suitability after project implementation. The availability of water and riparian areas is expected to remain largely the same, due to the application of riparian buffers and other protective measures. Although suitability will be retained it is expected that nesting habitat quality would be reduced in the commercially harvested and burned areas due to reduced canopy cover, although understory flight paths, important for foraging, would be improved with the reduced density of smaller trees. The plantations already contain relatively open understories, but are lacking in structural complexity, large trees, and diversity that benefit nesting and prey species.

Cumulative Effects

The cumulative effects analysis area for northern goshawk extends 1.5 miles (38,189 acres) beyond the maximum spatial extent of proposed project activities (Fig. 3), to encompass habitat that goshawks might use, but not so large as to dilute the effects on goshawk habitat from the Sunny South Project. The temporal analysis extends 20 years before and after the present in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the Analysis Area have been completed on a total footprint of approximately 12,441 acres (See Table 6). Most vegetation management on federal lands within the analysis area under CASPO interim guidelines and the revised Forest Plan included measures to protect spotted owl and northern goshawk territories, to retain large trees and some level of canopy cover in forested stands. These measures allowed stand improvement for resilience and to speed up and improve the trajectory of stand development while attempting to retain important habitat characteristics for these and other mature forest-dependent species. Nonetheless, this management direction resulted in thinning treatments that temporarily reduced habitat quality by reducing canopy closure and snag recruitment and increasing fine scale fragmentation with temporary roads and landings, but generally maintained existing habitat and increased the likelihood of long term resilience by reducing the risk of adverse effects to habitat from high severity wildland fire. The Volcano Fire plantations have been subjected to ongoing thinning as the stands grow; while other areas were thinned in response to past bug-kill and commercial thinning projects in natural stands. Sierran forests were subjected to a large bugkill in the early 1990's, which led to aggressive tree removal, which did not necessarily include the current snag retention standards, leaving most areas deficit in large snags.

Past projects affected approximately 1,439 acres of vegetation treatment in the HRCAs in the analysis areas, including fuels treatments and commercial thinning. Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (6,080 acres), private timber harvest (2,700 acres), and seed tree cut (555 acres) reduced goshawk habitat quality and quantity by reducing canopy cover below suitable levels. Altogether, private land makes up 26% of the analysis area, and includes large areas of unsuitable habitat for spotted owls. The private inholdings in the area vary in size, but contribute to the disturbance, fragmentation, and limited connectivity of suitable habitat.

Wildfires have occurred over approximately 3,640 acres (10%) of the analysis area over the last 20 years. Northern goshawk habitat that burned at high severity may still support goshawks, but the more open condition is rendered unsuitable for nesting and roosting. Relatively salvage harvest occurred within the cumulative analysis area. The Government Fire, American Complex, American Fire, Star Fire, and King Fire were very large fires in the surrounding landscape that reduced habitat suitability and greatly fragmented habitat and connectivity between territories in the middle elevation of the American River Ranger District.

The loss of canopy cover from the ongoing bugkill in the Sunny South analysis area is expected to reduce habitat values for nesting birds, whereas the increased number of snags and understory growth may increase productivity and prey species. An increase in snags and logs is expected to be beneficial, but at a certain point, the long-term loss of large trees is a substantial adverse effect. The proposed project would have positive and negative effects while attempting to prevent substantial adverse effects from treatment or non-treatment.

Although habitat analysis suggests portions of the Seed Orchard provide potentially suitable habitat, it is managed for relatively small trees in an open condition and is subjected to regular disturbance, and thus does not provide suitable habitat. The effect of this management is minimal, as it is ongoing, and alongside the heavily uses Foresthill Divide Road. Similarly, within the analysis area, the area just west of unit S-1 contains numerous large trees

The Biggie and Cuckoo Fuel Reduction and Vegetation Management Projects occur within a 3,000-acre footprint of the analysis area, near unit BF-1. These projects are expected to result in various degrees of short-term habitat change at the patch-scale, but overall project design standards are expected to maintain suitable habitat for the northern goshawk at the stand and landscape scale. Canopy cover reductions under both projects are expected to reduce habitat quality but maintain habitat suitability, much like the Sunny South project. These projects also include pre-commercial thinning and fuels treatments, resulting in more open and homogeneous understory conditions in the short term that likely have had localized impacts to prey species including some small mammals and songbirds by reducing or eliminating cover. Like the Sunny South project, these projects would include little or no treatment in the PACs, limited treatment in parts of the HRCAs, and thinning and fuels treatments in a particularly fire-prone area. These projects are on the edge of the Middle Fork American River, and contain some of the last unburned areas between the Ralston, American, and Star Fires.

Grazing in the Big Oak Flat area adversely affects understory vegetation and associated habitat for prey species and includes human management activities and associated disturbance. Grazing likely reduces prey density and contributes to ongoing disturbance, likely resulting in a small adverse effect on goshawks, although the grazing allotment is currently proposed for changes that would reduce adverse effects to vegetation and wildlife use.

Although goshawks appear to be less dependent on dense canopy cover than spotted owls, they appear to be more sensitive to human disturbance. The OHV trails in the analysis area do not directly affect the goshawk PACs, but may limit the suitability of other areas in the analysis area. There is currently a planned project to reroute several miles of trails where they are causing ongoing soil damage and erosion, including portions within the analysis area. Although these reroutes occur in potentially suitable habitat, they are not expected to increase use or affect known activity centers. The Sunny South project would contribute to this human disturbance in suitable habitat, although this disturbance would be temporary and directed by LOPs in the project design, limiting the contribution to OHV use and other existing disturbances.

Climate change may have a gradual effect on tree seedling survival, it may have a more rapid effect on disease or insect outbreaks, or it may occur almost overnight, in the form of wildfires. Modeling suggests reduced conifer densities, which would reduce habitat values for mature conifer-dependent species such as spotted owl, northern goshawk, and fisher. Meadow, shrub, and oak woodland species may benefit from the anticipated changes in forest structure. Direct metabolic impacts of warming climates on wildlife, their prey, diseases, and the vegetation that they utilize for habitat and forage may also have profound effects. Because interactions between various factors that make up a species' niche are complicated and synergistic, it is not possible to make precise predictions of climate change impacts, nor is it possible to exhaustively list all the effects, but may result in large disruptive changes. The Sunny South project is intended to respond to ongoing bugkill, which may be associated with climate change, by thinning unsustainably dense stands and increasing their resilience to bugkill and other stressors.

Overall past, present, and reasonably foreseeable future projects on forest land would cumulatively maintain suitable habitat by limiting treatments in PACs, reducing fuels accumulations, increasing resilience while limiting canopy cover reduction, and retaining snags and logs where available in surrounding conifer forest. In addition, all actions proposed by the TNF and permitted activities are considered both in regard to effects to suitable habitat and in regard to potential for disturbance to goshawk activity centers. If activities would lead toward unacceptable disturbance, an LOP or other measures are applied, as needed. While the level of activity and the acres cumulatively affected in the analysis area is high, most of these activities have been associated with managing the plantations toward a more natural condition, improving stand conditions in the face of ongoing and increasing stressors such as yearly and periodic drought, fire, and climate change. These actions produce tradeoffs in habitat quality, but are thought to provide the best opportunities to maintain or develop mature forest habitat conditions for northern goshawks. The proposed project would have similar effects as recent projects on forest land and would maintain California spotted owl suitability but would reduce habitat quality in the short term.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the northern goshawk.
Rationale:

- Habitat suitability would be retained.
- Project activities would not occur during the breeding season, February 15th to Sep. 15th, within ¼ mile of active nest sites.
- Important habitat attributes such as large trees and snags would be retained, particularly near watercourses.
- Habitat quality would be reduced in the short term but would benefit northern goshawks in the long term by reducing the risk of adverse effects from continued insect kill or high severity wildland fire.

PACIFIC MARTEN

A. Existing Environment

This species was previously classified as American marten (*Martes americana*) but recent genetic and morphological evidence have led to a re-classification as Pacific marten (*Martes caurina*) and of the subspecies *sierrae* (Aubry et al. 2012).

The marten historically occurred in forests throughout North America, experienced reductions in portions of its range due to intensive trapping and reduction in habitat quality, and has since been reestablished in portions of the historic range with natural expansions and with the aid of translocations (summarized in Kucera et al. 1995). In California, marten were trapped for fur until prohibited in 1946 in the extreme northwestern portion of the state, and throughout the State in 1953 (summarized in Kucera et al. 1995). The Humboldt marten subspecies was thought to be possibly extinct from the coastal range at one time (refer to Kucera et al. 1995, and Zielinski and Golightly 1996 as cited in Zielinski et al. 2001), but marten are now known to exist in a small area in California's north coast range (Zielinski et al. 2001, Slauson 2003, Slauson et al. 2007). Marten appear to be well distributed within their geographic ranges, including in the Sierra Nevada (Zielinski et al. 2001); however, Zielinski et al. (2005) reported a gap in the current distribution centered on Plumas County which was not historically present.

The largest potential threat to marten and their habitat resulting from forest management is the effect of forest thinning since clear-cutting is virtually non-existent on public lands. Harvesting on private land may still have significant effects to marten habitat availability. The effects of forest fragmentation has been reported in numerous cases in the literature, mainly describing the sensitivity of martens to the effects of forest fragmentation (Bissonette et al. 1997, Chapin et al. 1998, Hargis et al. 1999, Potvin et al. 2000 in Zielinski 2013), but in these cases, the fragmentation is typically due to regeneration or clear-cut harvests. How thinning treatments fragment habitat is poorly known, but it is under study in the Cascades in California (K. Slauson, unpubl. data; K. Moriarty, unpubl. data). Fuller and Harrison (2005) evaluated the effects of partial harvests on martens in Maine. They found martens used the partial harvest stands primarily during the summer, where 52-59 percent of the basal area was removed in partial harvests. Marten home ranges were larger when they used partial harvest stands, indicating poorer habitat quality in these areas. Partial harvested areas were avoided during the winter, presumably because they provided less overhead cover and protection from predators. How this study relates to predicting the effects of thinning in marten habitat in the Sierra Nevada is unclear, but it may suggest that martens would likely be associated with the more dense residual areas in thinned units and may also increase their home ranges, which may lead to decreased population density. The negative effects of thinning likely result from reducing overhead cover. Thinning from below, which retains overstory cover, probably has the least impact on marten habitat, provided they retain sufficient ground cover. Downed woody debris provides important foraging habitat for martens. Andruskiw et al. (2008) found that physical complexity on or near the forest floor, which is typically provided by coarse woody debris, is directly related to predation success for martens; when this complexity is reduced by timber harvest (a combination of clear-cut and selection harvests with subsequent site preparation in their study area), predation success declines. Marten home ranges in uncut forests had 30 percent more coarse woody debris (> 10 cm diameter) from all decay classes combined than in cut forests (Andruskiw et al. 2008).

In the northern Sierra Nevada marten generally occur at elevations of 3,400 feet to 10,400 feet, averaging 6,600 feet. Kucera et al. (1995) describe the distribution of the marten in California from eastern Siskiyou and northwestern Shasta Counties through the western slope of the Sierra Nevada to northern Kern County, and on the eastern slope of the Sierra Nevada as far south as central-western Inyo County. In the southern Cascades and northern Sierra Nevada, Kirk (2007) noted that 85% of contemporary marten detections in his analysis occurred above 6,000 feet elevation (despite a reduced survey effort at these higher elevations), 15% of detections were between 3,000 and 6,000 feet, and no detections of marten occurred below 3,000 feet elevation. They most often occur at somewhat higher elevations than the fisher (Freel 1991, Zielinski et al. 2005, Zielinski 2013). In contrast to the fisher, the marten distribution in California corresponds closely to the regions of the heaviest snowfall in the southern Cascades and the Sierra Nevada (Krohn et al. 1997). This may be due to lower mobility of the fisher in soft snow, as the foot-loading (ratio of body mass to total foot area) of the fisher is >2 times higher than the marten (Krohn et al. 2005). Where their ranges overlap, there may be negative competitive interactions between the fisher and marten (Krohn et al. 1995, Krohn et al. 1997). Fuller and Harrison (2005) note that fishers are a principal arboreal predator of martens in Maine.

Preferred forest types in the Sierra Nevada include mature mesic forests of red fir, red fir/white fir mix, lodgepole pine, subalpine conifer, and Sierran mixed conifer (Freel 1991). CWHR types 4M, 4D, 5M, 5D, and 6 are moderate to highly important for the marten (USDA Forest Service 2001). Analysis of effects to marten weighs heavily on the preferred habitat types, but consideration is given for the utilization of other marginal habitat types. Forest stands dominated by Jeffrey pine do not appear to support marten in the Tahoe National Forest (Martin 1987), as evidenced by the lack of marten detections in pure eastside pine (some of which were adjacent to mixed conifer stands which did contain marten detections) during systematic surveys conducted on the eastside of the Tahoe National Forest (data on file at Sierraville Ranger District).

Preferred habitat is generally characterized by dense canopy, multi-storied, multi-species late seral coniferous forests with a high number of large (> 24 inch dbh) snags and downed logs (Freel 1991). Late- and old-structure forests (with larger diameter trees and snags, denser canopy and more canopy layers, and plentiful course woody material) are thought to provide ample rest and den sites, protection from avian and mammalian predators, and foraging sites (Bull et al. 2005). Data from some studies shows that use of habitat by marten does not necessarily rely on high levels of canopy cover, but likely involves a complex interaction of habitat variables, at both small and large scales, which provide for their life history requirements and minimizes the risk of predation (refer to Soutiere 1979, Drew 1995, Chapin et al. 1997, and Slauson 2003). Koehler and Hornocker (1977) suggested that while open meadows and burns may be avoided by marten in winter when they are under a heavy snowpack, these areas may be used in the summer, or in low snow years, if they provide adequate cover and food.

Marten have been found to be generally associated with moist conifer-dominated forest conditions (eg. Spencer et al. 1983, Martin 1987, Buskirk et al. 1989, Wilbert et al. 2000, Mowat 2006, Baldwin and Bender 2008). Studies in the Sierra Nevada indicate martens have a strong preference for forest-meadow edges, and riparian forest corridors used as travel ways appear to be important for foraging (Spencer et al. 1983, Martin 1987). Spencer et al. (1983) found that in the lower Sagehen Creek basin on the eastside of the Tahoe National Forest below approximately 6,700 feet elevation, marten strongly preferred riparian lodgepole pine habitat and selected against brush, mixed conifer, and Jeffrey pine habitats; riparian areas were used more for activity than resting, and mixed conifers were used more for resting than activity. In the upper Sagehen basin above approximately 6,700 feet elevation, marten were found to strongly prefer red fir habitat associations for both resting and activity (Spencer et al. 1983). Spencer et al. (1983) found that marten preferred forest stands with 40-60% canopy cover at both resting and foraging sites and avoided stands with less than 30% canopy cover.

Coarse woody debris is an important component of marten habitat, especially in winter, by providing structure that intercepts snowfall and creates subnivean tunnels, interstitial spaces, and access holes (Andruskiw et al. 2008). Marten rest sites in winter are most often in subnivean sites, most often associated with course woody debris, especially during periods of colder temperatures and recent precipitation, but can also be found in association with rocks (Buskirk et al. 1989, Bull and Heater 2000, Wilbert et al. 2000). Rest sites next to course woody debris in the subnivean space offer thermal insulation in colder temperatures (Buskirk et al. 1989). Zielinski et al. (1983) suggested that marten activity varied to allow them to take advantage of subnivean dens utilized by their prey. Sherburne and Bissonette (1993) found marten more likely to utilize subnivean access points in areas that contained more abundant prey. They also found that when coarse woody debris covered a greater percent of the ground, marten use also increased (Sherburne and Bissonette 1993). Older growth forests with accumulated coarse woody debris provide the forest floor structure necessary to enable marten to forage effectively during the winter (Sherburne and Bissonette 1993). In Ontario, Andruskiw et al. (2008) found that despite having lower levels of course woody debris, the availability of subnivean access points was not less in regenerating forest compared to uncut forest due to access points created by low-reaching branches of young conifer trees; however, only the subnivean access points created by course woody debris contained small mammals and were used by marten.

Marten home ranges are large by mammalian standards, particularly for their size (Buskirk and Ruggiero 1994, Buskirk and Zielinski 1997). Martens exhibit a high level of variation in home range size throughout their range, and generally exhibit a low level of same-sex overlap (Bull and Heater 2001). From numerous studies across the range of the marten, Powell (1994) calculated the mean home range size for males to be 2,000 acres and for females 570 acres (as cited in Powell et al. 2003). Marten home range sizes in the Sierra Nevada have been reported to vary from approximately 420 to 1,800 acres for males, and 170 to 1,400 acres for females (summarized data from Simon 1980, Spencer 1981, Martin 1987, and Zielinski et al. 1997 as reported in Buskirk and Zielinski 1997). Variation in home range size may be a function of prey abundance or habitat quality (Ruggiero and Buskirk 1994). In northeastern Oregon, Bull and Heater (2001) found that home range size was not correlated to the amount of unharvested forest in their study. In Maine, Chapin et al. (1998) found that regenerating forest (stands harvested in approximately the past 15 to 20 years) composed a median of 22% (range 9-40%) of male home ranges and 20% (range 7-31%) of female home ranges; the largest residual forest patch (contiguous areas composing adjacent stands of mid- to late-successional forest) in the home range composed a median of 75% (range 30-90%) of male home ranges and 80% (range 51%-93%) of female home ranges.

Drew (1995) suggested that some fine-scale selection factor not linked to foraging strategy, such as minimizing the risk of predation by avoidance of open areas, appears to influence habitat selection, and recommended maintenance of landscape connectivity to prevent isolation of forest patches. Kirk (2007) found the best association for marten occurrence at the largest scale he modeled (30.9 mi^2), with amount of habitat, number of habitat patches, and land ownership category emerging as important variables, suggesting selection based upon broad scale landscape conditions. The size of openings that martens will cross in the Sierra Nevada or Cascades is currently under study (Zielinski 2013). However, in the Rocky Mountains, the average width of clear cuts (openings) crossed by martens was 460 feet; this distance is significantly less than the average width of clear cut openings that martens encountered but did not cross (average = 1,050 feet) (Heinemeyer 2002). Moreover, martens were more likely to cross larger openings (max distance = 600 feet.) that had some structures in them (i.e., isolated trees, snags, logs) than smaller openings (average distance = 160 feet) that had no structures (Heinemeyer 2002). Cushman et al. (2011) reported that snow-tracked martens in Wyoming strongly avoided openings and did not venture more than 55 feet from a forest edge.

In the Sagehen Creek basin in Tahoe National Forest, Moriarty et al. (2011) found that marten detections decreased from an average detection rate of 65% in the early 1980s (Spencer 1981, Zielinski 1981, Martin 1987) to 4% in her study conducted from 2007-2008, based on similar but not identical methodology. Analysis of prior research in this area showed that the distribution of marten detections changed spatially from a semi-uniform distribution in the upper and lower basin in 1980s to detections that were clustered in the southwest corner of the upper basin by the early 1990s (Moriarty et al. 2011). The reasons for the apparent decrease in marten abundance were not clear, but may have included reduction of habitat quality, increase in habitat fragmentation, loss of important microhabitat features such as snags and down woody material, or other factors (Moriarty et al. 2011). From 1984-1990 more than 30% of the forested habitat in the Sagehen basin was impacted by various logging treatments (Moriarty et al. 2011). Moriarty et al. (2011) suggested that rather than amount of habitat (which did not change significantly), it is likely that the size of patch core areas, distance between patches, spatial configuration of patches, and microhabitat features within patches may be more important for marten persistence.

In Yosemite National Park, Hargis and McCullough (1984) found that marten will cross meadows less than or equal to 50 meters wide in winter with no cover, and use scattered trees for cover across meadows greater than 50 meters wide to a maximum of 135 meters. Marten traveled in all major habitat types, without any detectable habitat preferences, but did not pause in openings (only in forests, ecotones, and on frozen streams); locations where they paused were associated with closer distance to the nearest tree, percentage of overhead cover, and height (< 3 meters) of overhead cover (Hargis and McCullough 1984). Larger open areas which lack ground cover may pose a predation risk for the marten (Drew 1995). Drew (1995) found that habitat dominated by defoliated stems (due to tree mortality from bug infestations in his study) may provide sufficient cover.

Prey species abundance is a critical component of the habitat and there is some dietary overlap with the fisher, particularly in the southern Sierra Nevada where they occur sympatrically (Zielinski and Duncan 2004). Both species prey heavily upon squirrels, but marten diet has been found to be diverse, including a variety of mammals, birds, reptiles, fish, insects, seeds, and fruits (Koehler and Hornocker 1977, Soutiere 1979, Hargis and McCullough 1984, Zielinski and Duncan 2004). Marten prey items vary seasonally and appears to depend on availability. Simon (1980) found insects dominating the diet in summer and fall, while Douglas squirrels (*Tamiasciurus douglasii*) provided the bulk of winter and spring nourishment. At Sagehen Creek, CA, within the Truckee Ranger District, Zielinski (1983) found microtine rodents the most frequent year-round prey. Douglas squirrels, snowshoe hare, northern flying squirrel, and deer mouse were taken almost exclusively during the winter; and squirrels and chipmunks formed the largest component of the diet from late spring through fall.

Numerous and heavily traveled roads are thought to be undesirable in order to avoid habitat disruption and/or animal mortality. Roads may decrease prey and food availability for marten as well as fisher (Allen 1987; Robitaille and Aubry 2000) due to prey population decreases resulting from road kills and/or behavioral barriers to movement. Other studies have shown that occasional one and two lane forest roads should not limit marten movements (Chapin et al. 1997; Mowat 2006; Kirk 2007). In two study sites in California (Lake Tahoe Basin Management unit and Sierra National Forest), Zielinski et al. 2008 found that off-highway vehicle and over-the-snow vehicle use (at least up to 1 vehicle per 2-hour time period) had no effect on marten occurrence, circadian activity, or sex ratio. In west-central Alberta, Webb and Boyce (2009) found that no traplines with consistent marten harvests through time had >36% of the trapline developed; in their study roads and oil and gas wells were the primary form of development.

Marten sightings within the Tahoe National Forest generally follow a band encompassing the higher elevations on either side of the Pacific Crest. Winter surveys for forest carnivores have confirmed marten presence within the Tahoe National Forest, generally spanning the Pacific Crest to the northeast and east of this project. The closest marten detection to the Sunny South project units is approximately 15 miles to the east. No marten dens are known within the analysis area; however, suitable denning habitat would be treated under the proposed action.

CWHR forest vegetation types, strata and canopy cover are the primary metrics used to compare project effects on the Pacific marten in this analysis. CWHR is useful in modeling predicted changes in pre-and post-treatment stand density and size classes in relation to habitat suitability for wildlife species such as the marten. The following CWHR types are described for marten high and moderate capability denning, resting, and foraging habitat types.

The following CWHR types and strata provide high capability denning habitat for this species: Montane Hardwood-Conifer and Montane Riparian (4M, 4D, 5M, 5D, and 6); and Lodgepole Pine and Red Fir (4M, 4D, 5M, and 5D). The following vegetation types and strata provide moderate capability denning habitat for marten: Aspen, Sierran Mixed Conifer, and White Fir (4M, 4D, 5M, 5D, and 6); Lodgepole Pine, Montane Hardwood-Conifer, Montane Riparian, and Red Fir (4P and 5P); and Jeffrey Pine (4M, 4D, 5M, and 5D).

The following CWHR types and strata provide high capability resting habitat for this species: Montane Hardwood-Conifer and Montane Riparian (4M, 4D, 5M, 5D, and 6); and Lodgepole Pine and Red Fir (4M, 4D, 5M, and 5D). The following CWHR types and strata provide moderate capability resting habitat for marten: Aspen, Ponderosa Pine, Sierran Mixed Conifer, and White Fir (4M, 4D, 5M, 5D, and 6); Lodgepole Pine, Montane Hardwood-Conifer, Montane Riparian, and Red Fir (4P and 5P); and Jeffrey Pine (4M, 4D, 5M, and 5D).

The following CWHR types and strata provide high capability foraging habitat for this species: Montane Hardwood-Conifer and Montane Riparian (4M, 4D, 5M, 5D, and 6); Lodgepole Pine and Red Fir (4M, 4D, 5M, and 5D); and Wet Meadow (all strata). The following vegetation types and strata provide moderate capability foraging habitat for marten: Aspen, Ponderosa Pine, Sierran Mixed Conifer, and White Fir (4M, 4D, 5M, 5D, and 6); Jeffrey Pine (4M, 4D, 5M, and 5D); Lodgepole Pine and Red Fir (3S, 3P, 4S, 4P, and 5P); and Montane Hardwood-Conifer and Montane Riparian (4P and 5P).

An estimated 8,310 acres of high and moderate capability denning habitat, 13,093 acres of high and moderate capability resting and foraging habitat currently exist for the Pacific marten within the analysis area. Habitat types overlap and sometimes occur in the same footprint.

B. Effects of the Proposed Action

Direct and Indirect Effects

Disturbance from the project under the proposed action could potentially occur to individuals, but would likely only result in a modification of foraging behavior. Any possible effects to foraging would be expected to be minor. Direct mortality (e.g. killing of an individual by equipment) is very unlikely to occur to this highly mobile and wary species.

An estimated 930 acres of denning habitat and 1,543 acres of resting and foraging habitat is proposed for treatment under the proposed action. Some or all of this could experience canopy cover reductions as a result of the proposed action (commercial thinning). Project design (e.g. minimum canopy closure retention) and management requirements (e.g. minimum snag and large woody debris retention) are expected to reduce the risk of detrimental effects (e.g. altering long term patterns of habitat use or rendering habitats unsuitable) to marten and their habitats that may result from implementation of the proposed project. The proposed project is not expected to reduce habitat suitability, largely due to the retention of a minimum of 40% canopy cover. Although habitat suitability is expected to be maintained under the proposed action, short term habitat quality would be reduced in treated suitable habitat because thinning and fuels treatments can affect marten abundance and distribution. The effects to the quality of marten habitat are expected to be short term and minor as treatments would occur over approximately 10 years allowing for ground cover and understory cover to recover in some areas prior to treating (e.g. masticating or underburning) others.

Large snags and large woody debris are important habitat attributes to the marten. The proposed action would affect the size and recruitment level of snags, but will not reduce snag densities below retention standards specified in the Forest Plan. Existing snag densities within the project area were modeled from stand data collected in 2011 using the Forest Vegetation Simulator (FVS) computer program. Snags 15" dbh or larger currently occur at an estimated mean density of 11 snags per acre (of those, 2 snags per acre are 30 inches dbh or larger) in the project area, greater than the Forest Plan's general guideline of 4 snags per acre 15" dbh or larger in west-side mixed conifer, hardwood, or ponderosa pine stands. Snag and large woody debris retention is expected to maintain sufficient snags for the Pacific martin. Snags would not be removed under the proposed action unless they present a safety hazard, which is expected to be uncommon, or are the result of bark beetle outbreak. The proposed action is expected to reduce snag density over the long term because thinning trees is expected to increase tree survival and reduce snag recruitment in trees 15 inches dbh or larger. The proposed action would reduce snag density to 5 snags per acre 15" dbh or larger (3 snags per acre would be 30 inches dbh or larger) 40 years in the future but is expected to improve recruitment of very large (30 inches dbh and greater) snags and woody debris over the long term. Large woody debris (averaged across the project area) would be retained for wildlife and recruited in areas where there is a deficit. In areas that would experience prescribed burning some large logs would be consumed, though an average of at least 5-10 tons per acre is expected to persist and contribute to maintaining suitable habitat for the Pacific marten.

Fine scale habitat fragmentation would result from implementation of the proposed action due to reductions in stand area or interior area and changes in stand edge. Stand area would be slightly reduced in association with "gaps" created as a result of removing beetle infested trees and the construction of temporary roads and landings. Larger openings associated with even-aged management prescriptions (e.g. clear cuts) are not proposed under the action alternative. Approximately 6 miles of temporary roads constructed or re-constructed under the proposed action. These changes in fine scale fragmentation within suitable Pacific marten habitat would be relatively small compared to the total acreage treated. Fine scale habitat fragmentation would not reduce marten habitat suitability across the project units and affects would decrease during the 20 years following project implementation as early seral vegetation becomes established and grows on closed and restored temporary roads and landings. Connectivity between large tracts of high capability habitats (e.g. bottom and low to mid-slope canyons and dense forested stands on north-facing slopes) would be retained under the proposed action. Habitat connectivity at the landscape scale is expected to be maintained at a level roughly equivalent to the existing condition based on the projection that suitable habitat will not be reduced as a result of the proposed action. Spotted Owl Protected Activity Centers provide untreated Pacific marten habitat with little disturbance and full retention of canopy cover, snags, and large woody debris. Risk of coarse scale fragmentation from wildland fire or large scale pathogen-induced stand mortality would be reduced in treatment areas.

Cumulative Effects

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 12,061 acres. Most vegetation management on federal lands within the analysis area in the past 20 years has been conducted utilizing uneven-aged prescriptions under either the CASPO Interim Guidelines (adopted in 1993) or SNFPA standards and guidelines (beginning in 2001). These commercial thinning prescriptions generally were "thinning from below," aimed at removing understory trees in the suppressed and intermediate canopy classes and some co-dominant trees while retaining overstory trees and the largest trees in the treated stands. While the CASPO Interim Guidelines would have allowed removal of canopy closure below 40 percent in some thinned stands, this was a minor component of the overall thinning acreage. Most of the commercial thinning has been conducted under Sierra Nevada Forest Plan Amendment standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in generally the largest trees. Adherence to this management direction resulted in thinning treatments that reduced habitat quality due to canopy closure and snag reduction and increased fine scale fragmentation (e.g. increasing the number of temporary roads and landings), but also maintained existing habitats, while reducing the risk of adverse effects from high severity wildland fire to Pacific marten habitat.

Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (8,360 acres) and seed tree cut (555 acres) reduced marten habitat quality by reducing canopy cover. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 20 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable marten habitat that was burned at high severity it is likely that most was rendered unsuitable. Hazard tree removal has likely occurred along roads and in recreation areas. Removing a minimal number of hazard trees is not expected to reduce overall canopy cover or tree size class and therefore would maintain habitat suitability but slightly reduce habitat quality as snags and large trees are important habitat attributes. Non-public lands account for 9,879 acres or 26% of the analysis area. It is expected that private timber harvests have reduced the quantity of available habitat where timber harvests included hardwood and hardwood conifer stands. The current condition is the best representation of the effects of past events.

Present and reasonably foreseeable future actions are detailed in the General Cumulative Effects section. The general effects of the these projects are expected to result in various degrees of short-term habitat change at the patch-scale, but overall project design standards would maintain suitable habitat for the marten at the stand and landscape scale. This proposed action would reduce canopy cover on 2,695 acres. Canopy cover reductions under all present and reasonably foreseeable future projects would result in short-term reductions in habitat quality but maintain habitat suitability. Pre-commercial thinning small diameter trees, typically <10 inch dbh, and fuels treatments would occur over approximately 3,079 acres (Cuckoo and Biggie Projects and Vegetation Management Projects) and would result in more open and homogeneous understory conditions for the short term that likely have had localized impacts to prey species including some small mammals and songbirds by reducing and eliminating cover.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the Pacific marten.

Rationale:

- Habitat suitability would not be reduced.

- There is a low chance of disturbance to individual marten during project implementation.
- Important habitat attributes would be retained (large snags and down woody material).

PALLID BAT

A. Existing Environment

The pallid bat occurs in western North America, from southern British Columbia to central Mexico and east to central Texas (NatureServe 2011). Within its range, it is associated with a variety of low elevation arid communities and at higher elevation conifer communities; its abundance is greatest in dry conditions (Rambaldini 2005). Throughout California, the pallid bat is usually found in low to middle elevation habitats below 6000 feet (Barbour and Davis 1969; Philpott 1997), however, the species has been found up to 10,000 feet in the Sierra Nevada Mountains. The range in California is statewide and it is predicted to occur on every National Forest in the Region (CWHR 2008). Occurrence records from the state (CNDDB 2011) indicate presence within the boundaries of the following National Forests: Cleveland NF, Eldorado NF, Inyo NF, Klamath NF, Lassen NF, Los Padres NF, Modoc NF, Plumas NF, San Bernardino NF, Sequoia NF, Sierra NF, Stanislaus NF, and the Tahoe NF. Forest Service records (NRIS 2011) indicate this species has been observed within the following National Forest boundaries: Angeles NF, Inyo NF, Los Padres NF, Mendocino NF, Modoc NF, Plumas NF, Shasta-Trinity NF, and the Tahoe NF.

Populations have declined in California within desert areas, in areas of urban expansion, and where oak woodlands have been lost (Brown 1996). There is a decreasing trend in abundance in southern California (Miner and Stokes 2005); trends elsewhere in the state have not been assessed. Miner and Stokes (2005) indicate urban expansion into suitable habitat as a source of continued population decline, especially in lower elevation habitat.

Pallid bats mate between October and February, have one to two pups per year, usually from late April to July, which are weaned in August, with seasonal variation (Rambaldini 2005; Hermanson and O’Shea 1983). Maternity colonies disperse after weaning (Rambaldini 2005).

Pallid bats are a gregarious species, often roosting in colonies of 20 to several hundred individuals. Pregnant females gather in summer maternity colonies of up to several hundred females, but generally fewer than 100 (Brown 1996). Males are typically absent from maternal colonies, or living in clusters of males separated from females in caves, mines, or buildings (Barbour and Davis 1969). Mating occurs in October after summer colonies have disbanded (Barbour and Davis 1969). Breeding probably occurs sporadically throughout the winter, at least until the later part of February. As with several other species of bats, live sperm can be retained in the uterus of the female through the winter and fertilize ova as they are released. Gestation period is estimated at 53-71 days (Barbour and Davis 1969). Parturition occurs between May and July with typically two young born (Barbour and Davis 1969; Burt and Grossenheider 1980; Zeiner et al. 1990). Young are weaned in mid to late August with maternity bands disbanding between August and October (Barbour and Davis 1969; Burt and Grossenheider 1980).

Pallid bats are opportunistic generalists that glean a variety of arthropod prey from surfaces, but also capture insects on the wing (Rambaldini 2005). They forage primarily in uncluttered, open habitats (Rambaldini 2005; Ferguson and Azerrad 2004). Pallid bats prey on flightless and mostly ground roving invertebrates, as well as those that perch exposed on vegetation (O’Shea and Vaughn 1977; Hermanson and O’Shea 1983). Common prey species are Jerusalem crickets, longhorn beetles, and scorpions, but it will also forage at low heights of 0.5 - 2.5 meters (1.6-8.2 feet) above the ground on large moths and grasshoppers (Barbour and Davis 1969; O’Shea and Vaughn 1977; Burt and Grossenheider 1980; Philpott 1997; Zeiner et al. 1990).

The pallid bat is strongly associated with arid regions (Hermanson and O'Shea 1983). Low elevation habitat includes rocky, arid deserts and canyons, shrub-steppe grasslands, and karst formations (Rambaldini 2005). It is also found in high elevation conifer forests (ibid.). Miner and Stokes (2005) suggest that riparian, chaparral, oak savannah, and cultivated areas are preferred habitat types, and Baker et al. (2008) further suggest open pine forest within higher elevations. In forested habitats in the Sierra Nevada Mountains, Baker et al. (2008) found pallid bats in areas with greater availability of Sierran mixed conifer and white fir than open meadows, grasslands, barren areas, and montane chaparral. They caution, however that they were unable to discern actual habitat use at a finer scale. Johnston and Gworek (2006) found pallid bat activity in the Sierra Nevada Mountains greatest where there was open mixed conifer forest near short grassland habitat. Roosts located were primarily in incense cedar trees (ibid.).

Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of man-made structures (Ellison et al. 2003). Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks (ibid.). Cavities in broken branches of black oak are very important and there is a strong association with black oak for roosting. Roosting sites are usually selected near the entrance to the roost in twilight rather than in total darkness. The site must protect bats from high temperatures, as this species is intolerant of roosts in excess of 104 degrees Fahrenheit (Philpott 1997).

Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges (Barbour and Davis 1969; Philpott 1997; Pierson 1996).

Winter roosts are cool (25-50˚ Fahrenheit) with a stable temperature range, and are located in protected structures, including caves, mines, and buildings (Rambaldini 2005). Pallid bats do not travel far from their summer range to their winter roost location (ibid).

The largest emerging threat to all cave-roosting species is white-nose syndrome. There is a grave concern that it could spread to the western states and California. As of April 2016, White-nose Syndrome.org records detections as far west as Oklahoma, with one reported case in Washington state (https://www.whitenosesyndrome.org/resources/map). This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006.

Habitat threats include loss of foraging habitat due to urban expansion in low elevation habitat (Philpott 1997; Ferguson and Azerrad 2004; Rambaldini 2005; Miner and Stokes 2005; Pallid Bat Recovery Team 2008) and loss of riparian habitat in arid areas. Conversions of dry grasslands and sagebrush habitat to orchards and other dense vegetative cover reduces foraging habitat (Chapman et al. 1994; Ferguson and Azerrad 2004; Pallid Bat Recovery Team 2008). Pesticide use in these agricultural areas may adversely impact invertebrate populations, thus affecting the pallid bat prey base (Ferguson and Azerrad 2004; Miner and Stokes 2005; Pallid Bat Recovery Team 2008). Intense grazing may likewise adversely impact foraging areas and prey diversity (Ferguson and Azerrad 2004; Ferguson and Azerrad 2004; Pallid Bat Recovery Team 2008), however properly managed grazing may not adversely impact foraging habitat.

The loss of large diameter snags and live trees for roosts due to fire can affect primarily day and night roosts (Miner and Stokes 2005). While this species typically roosts in rock outcrops, it often uses alternate day roosts, which large trees may provide. Retention of existing large trees and long term production of replacement large trees would provide potential habitat into the future.

Mine closures may eliminate roosting sites and hibernacula for pallid bats, even though this species primarily roosts in rock outcrops (Rambaldini 2005; Ferguson and Azerrad 2004; Miner and Stokes 2005; Pallid Bat Recovery Team 2008). Likewise bridge reconstruction may eliminate roost sites if done in a way that does not provide a design suitable to pallid bats (Ferguson and Azerrad 2004).

Pallid bats are also susceptible to disturbance in roosting sites and subsequent displacement (Rambaldini 2005), particularly hibernating individuals. Other human density-related threats include feral cats (Hermanson and O'Shea 1983; Ferguson and Azerrad 2004).

In 1999, Dr. Joe Szewczak, bat researcher from the White Mountain Research Station, initiated a program in the Carman Valley Watershed Restoration area at Knutson Meadow to monitor changes in bat diversity in relation to restoration activities. Pallid bats were detected in Carman Valley on the Sierraville Ranger District of the Tahoe National Forest through these monitoring efforts.

CWHR (2008) suggest that all habitat types within California provide suitable foraging habitat for pallid bats and the following provide suitable reproduction and roosting habitats: barren, blue oak woodland, chemise-redshank chaparral, coastal oak woodland, coastal shrub, eucalyptus, Klamath mixed conifer, mixed chaparral, Sierran mixed conifer, urban, valley oak woodland, and white fir. In the northern part of their range, sagebrush-steppe habitat is important (Ferguson and Azzerad 2004). Crevices in rock outcrops are the primary roost sites, although buildings, caves, tree hollows, and mines are also used (Hermanson and O'Shea 1983; Rambaldini 2005; Stephenson and Calcarone 1999; Miner and Stokes 2005; NatureServe 2011).

CWHR forest vegetation types, tree size, and canopy cover are the primary metrics for pallid bat habitat used for this analysis. Projected post-treatment habitat changes were derived from changes to current CWHR types based on estimated canopy cover reductions modeled using the forest vegetation simulator.

An estimated 3,941 acres of reproductive and roosting habitat, and 10,270 acres of foraging habitat currently exist for pallid bat within the analysis area. While there are known to be several mines within the analysis area, it is not known if these mines contain suitable roosting or hibernacula habitat. Alterations to these mines are outside the scope of the proposed action, but typical actions associated with mine closures include limited operating periods and installation of bat-friendly gates if suitable habitat is present. There are two occurrences of pallid bat in CNDDB, one northeast of Sierraville and one north of Calpine, both of which are more than 35 miles from the analysis area.

B. Effects

Direct and Indirect Effects

Direct effects may occur and could include disturbance of roosting bats causing temporary abandonment of a roost and/or changes in patterns of habitat use. Pallid bats are very sensitive to roost site disturbance (Zeiner et al. 1990, Philpott 1997). It is possible for bats to be roosting in snags during project implementation, and flushing of pallid bats at roosting sites to occur, particularly as implementation is expected to occur primarily during the daytime when pallid bats might be day roosting within or adjacent to treatment areas. There is also a potential for mortality if breeding or roosting trees are removed, although adult bats would likely abandon roost sites prior to tree falling, if they contain young, they may not be able to fly. Disturbance type effects would be limited because project implementation occurs over approximately a 10 year period, which would limit the amount of potential disturbance throughout the project area.

Pallid bat habitat is not expected to be reduced by the proposed action. In addition to trees that show signs of bark beetle infestation, large trees/snags that pose a safety hazard (e.g. to adjacent roads) and may be suitable for roosting would also be removed, although removal of large trees/snags would be incidental and would not substantially reduce large tree/snag availability across the project units. The project is expected to somewhat reduce availability of roost sites, either by removing hazard trees or as a result of operations and prescribed burning. No permanent, man-made structures that may support bat reproductive, roosting, or hibernacula sites (e.g. bridges or mines) would be removed or altered by the project. Effects to natural high capability reproductive habitats (e.g. caves and barren rocky areas) are not expected because the proposed project would not occur in these areas. Habitat quality is expected to improve in areas where dense understory vegetation is removed (pre-commercial thinning and fuels treatments) allowing for increased flight maneuverability and foraging opportunities.

Under the proposed action, oaks (which provide important roost sites) would be retained and growth will be enhanced by thinning of competing shade tolerant conifers. The proposed action targets the retention of oaks with an objective of increasing growth of the hardwood component within the treated stands. The proposed action would benefit the roosting habitat of the pallid bat by improving the health of oak stands within the project units. No reduction in habitat suitability is expected because habitat loss (e.g. even-aged stand management or vegetation type conversion) would not occur under the proposed action.

Implementation of the action alternative is not expected to result in changes in the quantity of pallid bat reproductive, roosting, or foraging habitats within the project area but would slightly reduce habitat quality through a reduction of large trees/snags that would be removed where they pose a safety hazard next to defined roads and improve habitat quality where treatments remove thick understory cover improving foraging opportunities.

Cumulative Effects

Specific past, present, and reasonably foreseeable future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS) lands within the analysis area have been completed on a total footprint of approximately 12,441 acres. Most vegetation management on federal lands within the analysis area in the past 20 years has been conducted utilizing uneven-aged prescriptions under either the CASPO Interim Guidelines (adopted in 1993) or SNFPA standards and guidelines (beginning in 2001). These commercial thinning prescriptions generally were “thinning from below,” aimed at removing understory trees in the suppressed and intermediate canopy classes and some co-dominant trees while retaining overstory trees and the largest trees in the treated stands. While the CASPO Interim Guidelines would have allowed removal of canopy closure below 40 percent in some thinned stands, this was a minor component of the overall thinning acreage. Most of the commercial thinning has been conducted under Sierra Nevada Forest Plan Amendment standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in generally the largest trees. Adherence to this management direction resulted in thinning treatments that reduced canopy closure and snag recruitment and increased fine scale fragmentation (e.g. increasing the number of temporary roads and landings), but also maintained existing habitats, and reduced the risk of adverse effects from high severity wildland fire.

Of the past projects that have occurred on forest land within the analysis area, treatments such as seed tree cuts (555 acres) are expected to have increased pallid bat habitat quality by increasing open shrubland habitat types while retaining the largest trees. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 20 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable pallid bat habitat that burned at high severity it is likely habitat quality and quantity increased through an increase in potential roost site availability (large snags) and decreased canopy cover though some hardwood habitat was lost. Other past treatments focused on understory removal including pre-commercial thinning (9,448 acres), thinning for fuels reduction (962 acres), and underburning (6,305 acres) occurring within the analysis area have likely increased habitat quality, as thick understory stands reduce the ability of pallid bats to fly in these area. Past commercial thinning treatments (8,784 acres) are not expected to have reduced quantity or quality of pallid bat habitat. Hazard tree removal has likely occurred along roads and in recreation areas. Removing a minimal number of hazard trees is not expected to reduce overall canopy cover or tree size class and therefore would maintain habitat suitability but slightly reduce habitat quality as snags and large trees are important habitat attributes. Non-public lands account for 9,879 acres or 26% of the analysis area. It is expected that private timber harvests have reduced the quantity of available habitat where timber harvests included hardwood and hardwood conifer stands.

The current condition is the best representation of the effects of past events. Although past actions on forest land are not expected to have reduced pallid bat habitat, all past actions have added to the potential for disturbance to roost sites though these projects mostly occurred over the last 20 years which limits the suitable habitat that would be subject to disturbance on a yearly basis.

Present and reasonably foreseeable future actions occurring within the analysis area are detailed in the General Cumulative Effects section. The general effects of these projects are expected to result in various degrees of short-term habitat change at the patch-scale, but overall project design standards would maintain suitable habitat for the pallid bat at the stand or landscape scale. The proposed project will reduce canopy cover on 2,695 acres and the reasonably foreseeable future actions will reduce canopy cover over approximately 3,079 acres within the analysis area. Canopy cover reductions under these projects would not be substantial enough to affect habitat quality or suitability. Pre-commercial thinning small diameter trees, typically <10 inch dbh, and fuels treatments would result in more open and homogeneous understory conditions for the short term that likely increase habitat quality for the pallid bat by decreasing understory density and increasing flight opportunities.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the pallid bat.

Rationale:

- Disturbance type effects would be spread over an estimated 10 year period.
- Habitat suitability would be retained.
- Important habitat attributes would be retained (large trees and snags).
- Oak habitat would be enhanced.
- Open understory conditions would increase habitat quality.

TOWNSEND'S BIG-EARED BAT

A. Existing Environment

The Townsend's big-eared bat occurs throughout western North America, from southern British Columbia to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States (Pierson and Rainey 1998; Sherwin 1998; NatureServe 2011). In California, the range is nearly state-wide except the highest peaks of the Sierra Nevada Mountains, including each National Forest within Region 5 (CWHR 2008). Records in the California state database also indicate a statewide distribution, and occurrence on most R5 Forests except the Angeles NF, Eldorado NF, Lake Tahoe Basin Management Unit, Los Padres NF, and Six Rivers NF (CNDDB 2011). Forest Service NRIS records (accessed November 2011) since the 1990s are more scant, and indicate a presence on the Cleveland NF, Eldorado NF, Inyo NF, Mendocino NF, Modoc NF, Plumas NF, Shasta-Trinity NF and Lake Tahoe Basin Management Unit. Townsend's big-eared bats have been captured during survey efforts on the Six Rivers NF (Siedman and Zabel 2001).

Historically, the Townsend's big-eared bat was found throughout California as a scarce, but widespread species (Barbour and Davis 1969). It ranges from sea level to 3,300 meters (10,827 feet) in elevation in a wide range of vegetation types (Sherwin 1998; Barbour and Davis 1969; Philpott 1997; CWHR 2008). Its distribution is strongly correlated to geomorphic features such as natural and man-made caves, buildings, and bridges (Pierson et al. 1999; Ellison et al. 2003a and 2003b; Sherwin et al. 2003; Gruver and Keinath 2006). Caves and mine adits typically are used as hibernacula by both sexes (Piaggio 2005). These, along with old buildings, bridges, and large trees may be used as roost sites (Piaggio 2005). It is generally understood that these bats have high roost sight fidelity (Pierson and Rainey 1998; O'Shea and Bogan 2003; Ellison et al. 2003a and 2003b; Piaggio 2005; Gruver and Kenaith 2006), even though use of a specific sight may vary through time (Sherwin et al. 2003).

Population trends have been reportedly declining across the state (Pierson and Rainey 1998; Pierson et al. 1999; Miner and Stokes 2005). However, recent research suggests that absence at historic sites, and subsequent reports of population declines, may be a result of insufficient survey effort, especially where multiple potential roosts are available (Ellison et al. 2003a; Sherwin et al. 2003). Furthermore, statistical inferences about this species cannot be made for populations in the western United States (Ellison et al. 2003a). As such, Ellison and others (2003a) suggest caution in interpreting the population declines in California. It is clear that further research and population monitoring is needed to determine trends in the state.

With the above caution in mind, Pierson and Rainey (1998) reported on Townsend's big-eared bat populations in California. They reported substantial changes over the last 40 years in Townsend's big-eared bat total individuals (54 percent decline), maternity colonies (52 percent decline), available roosts (45 percent decline), and average colony size (33 percent decline). Pierson and others (Pierson and Rainey 1998; Pierson et al. 1999) did report that there was unmistakable evidence that some roosts were deliberately destroyed and bats were killed. The Mother Lode country (central Sierra Nevada Mountains and foothills) and the Colorado River area apparently have the most marked declines (Pierson and Rainey 1998).

Mating typically occurs from November to February after bats have entered their hibernaculum for the winter, although some females will be inseminated prior to hibernation (Barbour and Davis 1969; Burt and Grossenheider 1980; Jameson and Peeters 1988; Kunz and Martin 1982; Zeiner et al. 1990). After delayed implantation and a 56-100 day gestation period females give birth to a single pup in May or June (ibid.), sometimes after a move to a nursery colony (Pierson and Rainey 1998). In western North America, almost all spring and summer concentrations of Townsend's big-eared bats are females that have returned to their natal site to give birth and raise their young (Pierson and Rainey 1998). Young are weaned in six weeks, and can fly two-and-a-half to three weeks after birth (Barbour and Davis 1969; Burt and Grossenheider 1980; Jameson and Peeters 1988; Kunz and Martin 1982; Zeiner et al. 1990). Caves and mine adits are commonly used as maternity sites, as well as for winter hibernacula. Males leave the nursery colony after the first summer and typically roost alone (Pierson and Rainey 1998).

Townsend's big-eared bats hibernate singly or in small clusters, usually several dozen or fewer, from October to April (Zeiner et al. 1990). Winter hibernating colonies are composed of mixed-sexed groups and may range from a single individual to several hundred animals (Piaggio 2005). *P. townsendii* hibernates throughout its range in caves and mines where temperatures are approximately 50 degrees Farnheit or less, and generally above freezing. Individuals may move during winter in response to temperature change (Barbour and Davis 1969). Townsend's big-eared bats utilize well-ventilated, cold caves and mine tunnels as hibernacula, in particular locations from which they can hang from the ceiling (Gruver and Keinath, 2006; Pierson and Rainey 1998). In addition to caves and mine tunnels, bridges and old buildings may be utilized as roosts (Barbour and Davis 1969; Pierson and Rainey 1998). Roosting in tree hollows has been reported in coastal California habitats (Fellers and Pierson 2002; Gellman and Zielinski 1996).

Townsend's big-eared bats do not migrate long distances (Barbour and Davis 1969; Humphrey and Kunz 1976; Dobkin et al. 1995; Woodruff and Ferguson 2005). Townsend's big-eared bats change roosts throughout the season (Fellers and Pierson 2002; Sherwin et al. 2001), which may complicate survey efforts (Sherwin et al. 2003). Even in cool climates, Townsend's big-eared bats may change roosts in the winter (Woodruff and Ferguson 2005).

This species is a moth specialist but feeds on a variety of lepidopterans (i.e., moths, butterflies, skipper butterflies, and moth-butterflies) (Pierson and Rainey 1998). Pierson et al. (1999) summarized other research that includes consumption of other invertebrate orders in small amounts. Small moths, beetles, and a variety of soft-bodied insects also are taken in flight using echolocation, or by gleaning from foliage (Jameson and Peeters 1988; Zeiner et al. 1990). They are known to drink water. This bat forages relatively close to its roosts sites (Gruver and Kenaith 2006).

Flight is slow and maneuverable, with the species capable of hovering (Zeiner et al. 1990; Gruver and Kenaith 2006) and perhaps gleaning insects off foliage (Gruver and Kenaith 2006). Foraging usually begins well after dark (Kunz and Marten 1982). This bat will forage above and within the canopy (Pierson et al. 1999), often along forest edges and riparian areas (Piaggio 2005), and seems to be well adapted to a moderately cluttered canopy (Gruver and Kenaith 2006). As stated, foraging habitat includes a wide variety of vegetation types. Suitable foraging habitat in California includes agricultural types, dense forests, desert scrub, moist coastal forests, oak woodlands, and mixed conifer-deciduous forests (Pierson and Rainey 1998), in particular along habitat edges (Fellers and Pierson 2002). Habitat connectivity between roosting and foraging sites may be important for this species, especially because individuals tend to avoid open spaces (Gruver and Kenaith 2006).

This bat is associated with a wide range of vegetative types, including forests, desert scrub, pinyon-juniper woodlands, and agricultural development (Gruver and Keinath 2006; Kunz and Martin 1982; Piaggio 2005; CWHR 2008). Roost structure is believed to be more important than the local vegetation (Gruver and Keinath, 2006; Pierson and Rainey 1998) and the presence of suitable caves or cave-like structures defines the distribution of this species more so than does suitable foraging habitat (Barbour and Davis 1969; Pierson and Rainey 1998; Piaggio 2005; Gruver and Keinath, 2006). In California, this bat is known to use lava tubes, man-made structures (buildings, bridges, and mines, for example), some limestone caves (Kunz and Martin 1982), and large trees (Piaggio 2005).

Wildlife habitat associations in California (CWHR 2008) are broad. These bats are often associated with forest edges, open forests, shrub and scrub habitats, grasslands, and riparian areas (CWHR 2008; or drier habitats where there is free water (Geluso 1978). Free water is an important habitat feature for this bat as it has a relatively poor urine-concentrating ability; it can meet some of its water needs metabolically (Geluso 1978).

The most critical habitat feature for this species is cave and cave-like roosting structures and hibernacula. With the increase in mining in the 1800s, potential roosting sites increased with the development of mines. Actual use of these mines for roost purposes likely did not occur until many of the mines shut down or were abandoned. This species is found in mines more than any other species (Barbour and Davis 1969; Sherwin et al. 2003). Likewise, buildings and bridges are also used by Townsend's big-eared bats, especially on the west coast and in forested areas (Barbour and Davis 1969). Human disturbance in caves and mines can result in the bats moving their roosting location within the cavern or abandoning the site altogether (Barbour and Davis 1969; Pierson et al. 1999; Gruver and Keinath 2006).

The largest emerging threat to all cave-roosting species is white-nose syndrome. There is a grave concern that it could spread to the western states and California. As of April 2016, White-nose Syndrome.org records detections as far west as Oklahoma, with one reported case in Washington state (https://www.whitenosesyndrome.org/resources/map). This disease has rapidly spread throughout the eastern US and Canada since its discovery in 2006.

A significant threat to Townsend's big-eared bats is disturbance or destruction of roost sites, in particular hibernacula and nursery sites (Pierson et al. 1999; Piaggio 2005; Woodruff and Ferguson 2005; Bradley et al. 2006). Roost structure is believed to be more important than the local vegetation (Gruver and Keinath, 2006; Pierson and Rainey 1998) and the presence of suitable caves or cave-like structures defines the distribution of this species more so than does suitable foraging habitat (Barbour and Davis 1969; Pierson and Rainey 1998; Piaggio

2005; Gruver and Keinath, 2006). Visitation during critical periods can adversely affect bats in those sites, often leading to reduced populations (Pierson et al. 1999). In such an event, rousing from torpor uses valuable fat reserves which are needed to sustain physiological processes throughout the hibernation period. A single visit may result in abandonment of the roost (Barbour and Davis 1969; Zeiner et al. 1990). Low fecundity (one pup/year) and high first year mortality means disturbance at a hibernacula or nursery roost can be potentially detrimental, although by limiting disturbance, populations can recover in part because survival rate in subsequent years is higher (Pierson et al. 1999).

Mine closures, often with the intent to protect human safety, can eliminate access to roosts and hibernacula (Miner and Stokes 2005). Reactivation of mines may eliminate cave roosts and hibernacula, or cause disturbance such that bats will abandon a site (Pierson et al. 1999). Because this species uses alternate roost sites over time (during a single season as well as over many years), potential roosts must be surveyed at least eight times in order to determine vacancy (Sherwin et al. 2005).

Reopening of closed or inactive mine tunnels for mineral extraction would likely disturb all roosting bats, resulting in abandonment of those sites. If many tunnels in relatively close proximity are reopened, there could be serious adverse impacts to bat roost sites, and subsequently to bat populations at the local scale because this species, among others, has a high affinity to roost sites. Present day mining operations are likely to be surface or open-pit efforts that would affect foraging habitat (vegetation) as well as the tunnels that have become roosting habitat (Bogan 2000).

Contaminants may come from various sources and may directly or indirectly affect bats, although little research has been done (O'Shea et al. 2000). Waste material impoundments can be a threat to this species because it must drink water, and water sources are especially important in dry habitats; bats have been killed when trapped in oily water associated with drilling operations (O'Shea et al. 2000). Radiation may be a source of toxicity for bats roosting deep in mines, as well (ibid.). Pesticide spraying may locally deplete food resources which may be particularly challenging for nursing females that need to forage further and further from nursery roosts as pups grow (Woodruff and Ferguson 2005).

The effects of timber management and prescribed fire on bat habitat are not well understood (Woodruff and Ferguson 2005). Humes et al. (1999) found bats to be more active in old-growth and thinned forest stands than in dense, unthinned stands, suggesting that the increased structural diversity benefitted bats, including Townsend's big-eared bats.

In the Tahoe National Forest, the only documented maternal colony of Townsend's big-eared bats occurs near the town of Sierra City, approximately 28 miles to the north of the treatment units. Townsend's big-eared bats were also observed on the Tahoe National Forest in Carmen Valley by Dr. Joe Szewczak (White Mountain Research Station) between 1999 and 2001.

CWHR vegetation types, strata, and canopy cover are the primary metrics used for the Townsend's big-eared bat in this analysis. Stand data was collected within the proposed action area and changes resulting from the proposed action is modeled by prescription. No high capability habitats are identified in CWHR (version 8.2). Barren provides moderate capability reproductive and resting habitats for this species while the following CWHR types and strata provide moderate capability foraging habitat for this species: Aspen, Montane Hardwood, and Montane Hardwood-Conifer (4S and 4P); Montane Riparian, Ponderosa Pine, Sierran Mixed Conifer, Valley Foothill Riparian, and White Fir (4S, 4P, 5S, and 5P); and Wet Meadow (all strata).

An estimated 362 acres of moderate capability reproductive and resting habitats and 2,890 acres of moderate capability foraging habitat currently exist for Townsend's big-eared bat within the analysis area.

B. Effects

Direct and Indirect Effects

Direct effects may occur and could include disturbance of foraging bats causing temporary changes in patterns of habitat use. Disturbance to roost sites is unlikely as mines, caves, bridges, and buildings would not be affected by the proposed action. Disturbance type effects would be limited as project implementation occurs over approximately a 10 year period, which would limit the amount of potential disturbance occurring on a yearly basis within the project area.

Townsend's big-eared bat habitat is limited within treatment units as these bats are most commonly associated with caves and mines for roosting and open canopy forested habitat types for foraging, while the proposed action targets dense forest and plantations. The loss of bat roosts is unlikely as large snags, which are more likely to exhibit characteristics favorable for bat roosting, are targeted for retention by this project. In addition to trees that show evidence of bark beetle infestation, large snags that pose a safety hazard (e.g. to adjacent roads or recreation areas) could be removed. Although this scenario is expected to be the exception rather than the norm. Permanent, man-made structures that may support bat reproductive or roosting habitats (e.g. bridges or mines) would not be removed or altered by this project. Effects to natural moderate capability reproductive or resting habitats (e.g. caves and barren rocky areas) are not expected as project implementation would not occur in these areas. The quantity and capability of foraging habitats would not be affected; however, all treatment types proposed under the proposed action would create structural diversity which is expected to increase habitat quality throughout the project area.

Cumulative Effects

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 3,079 acres. Most vegetation management on federal lands within the analysis area in the past 20 years has been conducted utilizing uneven-aged prescriptions under either the CASPO Interim Guidelines (adopted in 1993) or SNFPA standards and guidelines (beginning in 2001). These commercial thinning prescriptions generally were "thinning from below," aimed at removing understory trees in the suppressed and intermediate canopy classes and some co-dominant trees while retaining overstory trees and the largest trees in the treated stands. While the CASPO Interim Guidelines would have allowed removal of canopy closure below 40 percent in some thinned stands, this was a minor component of the overall thinning acreage. Most of the commercial thinning has been conducted under Sierra Nevada Forest Plan Amendment standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in generally the largest trees. Adherence to this management direction resulted in thinning treatments that reduced canopy closure and snag recruitment and increased fine scale fragmentation (e.g. increasing the number of temporary roads and landings), but also maintained existing habitats, and reduced the risk of adverse effects from high severity wildland fire.

Of the past projects that have occurred on forest land within the analysis area, treatments are expected to have had little effect on roost site availability due to vegetation projects not occurring in caves, mines, or man-made structures. Foraging habitat is more likely to be effected by vegetation management and likely improves the quality due to reduced canopy cover and improved structural diversity. Past treatment types such as seed tree cuts (555 acres) are expected to have increased habitat quality by increasing open shrubland habitat types while retaining the largest trees. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 20 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable Townsend's big-eared bat habitat that was burned at high severity it is likely that most was rendered unsuitable for the short term but open shrub fields that quickly grow following severe fires would return habitat suitability to these area. Past fire salvage which has occurred over approximately 716 acres of burned forest within the analysis area. Suitable habitat within burned forests remained suitable for this species following fire salvage though habitat quality was reduced as a result of the removal of majority of large snags which are potential roosting sites for the Townsend's big-eared bat. Hazard tree removal has occurred over 1,072 acres within the analysis area. Removing a minimal number of hazard trees is expected to reduce habitat quality as snags and large trees that could be used as roosting sites would be removed but would not reduce availability across the project units. Other past treatments that either reduce canopy cover or understory cover included commercial thinning (1,829) pre-commercial thinning (3,701 acres), mastication (408 acres), thinning for fuels reduction (350 acres), and underburning (352 acres) within the analysis area have likely increased habitat quality by increasing structural diversity.

Private land accounts for 9,879 acres or 26% of the analysis area. It is expected that private timber harvests have reduced the quantity of available habitat where timber harvests included hardwood and hardwood conifer stands. The quality of habitat was also reduced in fire salvaged areas that reduced large snags available for roost sites.

The effects of past actions can best be quantified by discussing what is present today. All past actions have added to the potential for disturbance to foraging habitat, though these projects occurred over the last 20 years which limits the suitable habitat that would be subject to disturbance on a yearly basis.

Present and reasonably foreseeable future actions occurring within the analysis area are detailed in the General Cumulative Effects section. The general effects of these projects are expected to result in various degrees of improvement of habitat conditions at the patch-scale, but overall project design standards would maintain suitable habitat for Townsend's big-eared bat at the stand or landscape scale. The proposed project will reduce canopy cover on 2,695 acres and the reasonably foreseeable future actions will reduce canopy cover over approximately 3,079 acres within the analysis area. Canopy cover reductions under these projects would improve habitat for Townsend's big-eared bat but would not be substantial enough to affect habitat suitability. Pre-commercial thinning small diameter trees, typically <10 inch dbh, and fuels treatments would result in more open and homogeneous understory conditions for the short term that likely increase habitat quality for the Townsend's big-eared bat by decreasing understory density and increasing flight opportunities.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the Townsend's big-eared bat.

Rationale:

- There is a possibility of disturbance during project implementation.
- Suitable habitat would be retained.
- An improvement in the quality of foraging habitat would occur.
- Threats to Townsend's big-eared bats or their habitats would remain stable (e.g. no reduction or alteration to caves, mines, or structures) or be reduced (e.g. risk of wildland fire).

FRINGED MYOTIS

A. Existing Environment

The fringed myotis is found in western North America from south-central British Columbia to central Mexico and to the western Great Plains (Natureserve 2012). In California, it is distributed statewide except the Central Valley and the Colorado and Mojave Deserts (CWHR 2008).

In California, the species is found the throughout the state, from the coast (including Santa Cruz Island) to greater than 5,900 feet in elevation in the Sierra Nevada. Records exist for the high desert and east of the Sierra Nevada (e.g., lactating females were captured in 1997 by P. Brown near Coleville on the eastern slope of the Sierra Nevada). However, the majority of known localities are on the west side of the Sierra Nevada (Angerer and Pierson draft). Museum records suggest that while the fringed myotis is widely distributed in California, it is rare everywhere.

According to Forest Service records, the fringed myotis is found on the Angeles NF, Eldorado, NF, Los Padres NF, Mendocino, NF, Modoc NF, Plumas, NF, Shasta-Trinity, NF, the Sierra NF, Lake Tahoe Basin Management Unit, and the Tahoe NF. State records (CWHR 2008) add the Cleveland NF, Inyo NF, Klamath NF, Lake Tahoe Basin, Lassen NF, San Bernardino NF, Sequoia NF, Six Rivers NF, and Humboldt-Toiyabe NF.

The fringed myotis roosts in crevices found in rocks, cliffs, buildings, underground mines, bridges, and in large, decadent trees (Weller 2005). The majority of maternal roost sites documented in California have been found in buildings (Angerer and Pierson draft). Mines are also used as roost sites (Cahalane 1939, Cockrum and Musgrove 1964, Barbour and Davis 1969). Like many cave roosting species, fringed myotis colonies are susceptible to disturbance in hibernacula and maternal colonies (CWHR 2008; O'Farrell and Studier 1973, 1980).

Maternity roosts have been found in sites that are generally cooler and wetter than is typical for most other Vespertilionids (Angerer and Pierson draft). Recent radio-tracking studies in the forested regions of northern California have shown that this species forms nursery colonies in predominantly early to mid- decay stage, large diameter snags from 23" to 66" dbh (Weller and Zabel 2001).

The fringed myotis occurs in dry woodlands (oak and pinyon-juniper most common (Cockrum and Ordway 1959, Jones 1965, O'Farrell and Studier 1980, Roest 1951), hot desert-scrub, grassland, sage-grassland steppe, spruce-fir, mesic old growth forest, coniferous and mixed deciduous/coniferous forests, including multi-aged sub-alpine, Douglas fir, redwood, and giant sequoia (O'Farrell and Studier 1980, Pierson and Heady 1996, Pierson et al. 2006, Weller and Zabel 2001). To generalize, this species is found in open habitats that have nearby dry forests and an open water source (Keinath 2004).

There seems to be increased likelihood of occurrence of this species as snags greater than 11.8 inches in diameter increases and percent canopy cover decreases (Keinath 2004). Large snags and low canopy cover, typical of mature forest habitat types, offer warm roost sites (Keinath 2004). Decay classes were two to four (Keinath 2004) in ponderosa pine, Douglas-fir, and sugar pine. Water sources may include artificial sources, such as stock tanks and ponds, in addition to natural sources (Keinath 2004).

Home range size varies with insect abundance, increasing as the number of available insects decreases. Keinath (2004) reports study averages of about 100 acres. Little is known about predation, but it is not suspected to significantly affect fringed myotis populations (Keinath 2004).

Fringed myotis appears to be highly dependent on tree roosts within forest and woodland habitats and potentially requires denser vegetation for foraging. In some forested settings, fringed myotis appears to rely heavily on tree cavities and crevices as roost sites (Weller 2005), and may be threatened by certain timber harvest practices. For example, Chung-MacCoubrey (1996) in Arizona found that this species prefers large diameter (18-26 inch dbh) conifer snags. Most of the tree roosts were located within the tallest or second tallest snags in the stand, were surrounded by reduced canopy closure, and were under bark (ibid.). Tree roosting behavior is consistent with an observed association between fringed myotis and heavily forested environments in the northern part of its range (M. Brigham pers. comm., E. Pierson and W. Rainey pers. obs.).

This species shows high roost site fidelity (O'Farrell and Studier 1980), especially when roost structures are durable or in low availability (Brigham 1991, Kunz 1982, Lewis 1995). Weller and Zabel (2001) noted frequent roost switching in tree roosts, but high fidelity to a given area. Roost switching has also been reported for caves (Baker 1962) and buildings (O'Farrell and Studier 1973, Studier and O'Farrell 1972). Fringed myotis are highly sensitive to roost site disturbance (O'Farrell and Studier 1973, 1980).

The removal of snags and hardwoods during timber harvesting and the loss of hardwoods through conifer and brush competition (from a lack of fire management) has caused reductions for both roosting structures and foraging habitat. These practices are likely to be more severe on privately owned lands. An increased demand for firewood can also lead to a decrease in available snags as roosts. Habitat alteration threatens this species because it is dependent on older forest types. Keinath (2004) summarized this in the Rocky Mountain Region conservation assessment for the fringed myotis, indicating that this species depends on abundant large diameter snags and trees with thick loose bark.

This species often forages along secondary streams, in fairly cluttered habitat. It also has been captured over meadows (Pierson et al. 2001). Fringed myotis is known to fly during colder temperatures (Hirshfeld and O'Farrell 1976) and precipitation does not appear to affect emergence (O'Farrell and Studier 1975). Post-lactating females have been known to commute up to 13 kilometer (8 miles) with a 930 meter (3,100 feet) elevation gain between a roost and foraging area (Miner and Brown 1996). Keinath (2004) found that travel distances from roosting to foraging areas may be up to five miles.

Fringed myotis are known to occur on the Tahoe National Forest and have been detected in Carman Valley (Szewczak 2004), Antelope Valley (California Fish and Wildlife CNDDB) and 3 miles southwest of Downieville, California (Forest Service NRIS Database). The nearest of these detections to the analysis area are the occurrences southwest of Downieville. Surveys have not been conducted within the analysis area.

CWHR forest vegetation types, tree size, and canopy cover are the primary metrics for fringed myotis habitat used for this analysis. Projected post-treatment habitat changes were derived from modeling changes to current CWHR types based on stand exam data. The Barren vegetation type provides high capability reproductive and resting habitats for this species while the following CWHR types and strata provide moderate capability reproductive and resting habitats: Blue Oak Woodland, Blue Oak Foothill Pine, Coastal Oak Woodlands, and Valley Oak Woodlands (all strata 3S and greater). For the purposes of this analysis and based on the importance of oak habitats to this species, Montane Hardwood and Montane Hardwood-Conifer are also considered to provide moderate capability resting habitat. The following CWHR types provide high capability foraging habitat: Barren, Blue Oak Woodland, Joshua Tree, and Juniper (all strata), Blue Oak Foothill Pine and Coastal Oak Woodlands (all strata up to 4P, 5S, 5P), Valley Foothill Riparian (all strata up to 3D), and Valley Oak Woodland (all strata up to 4P, 5S, 5P). Moderate foraging habitat includes CWHR types: Coastal Oak Woodlands (4M, 4D, 5M, 5D), Valley Oak Woodlands (all strata greater than 3S), Montane Hardwood, Montane Hardwood Conifer, Montane Riparian, Pinyon Juniper, and Sagebrush (all strata), Valley Foothill Riparian (all strata greater than 4S), Valley Oak Woodland (4M, 4D, 5M, 5D).

An estimated 14,066 acres of high and moderate capability reproductive and resting habitat and 14,118 acres of high and moderate capability foraging habitat currently exist for the fringed myotis within the analysis area (some habitats overlap).

B. Effects

Direct and Indirect Effects

Direct effects may occur and could include disturbance of roosting bats causing abandonment of a roost and/or changes in patterns of habitat use. It is possible for bats to be roosting in snags during project implementation, and flushing of fringed myotis at roosting sites to occur, particularly as implementation is expected to occur primarily during the daytime when fringed myotis might be day roosting within or adjacent to treatment areas. There is also a potential for mortality if roosting trees are removed, though this is unlikely as sensitivity to disturbance would likely cause the bats to abandon roost sites prior to tree falling. Disturbance type effects would be limited as project implementation occurs over approximately a 10 year period, which would limit the amount of disturbance that occurs on any given year throughout the project area.

Fringed myotis habitat is not expected to be reduced by the proposed action. In addition to trees that show signs of insect infestation, large trees/snags that pose a safety hazard (e.g. to adjacent roads) and may be suitable for roosting would also be removed, although removal of large trees/snags would be incidental and would not substantially reduce large tree/snag availability across the project units. The project is expected to somewhat reduce availability of roost sites, either by removing hazard trees or as a result of operations and prescribed burning. No permanent, man-made structures that may support bat reproductive, roosting, or hibernacula sites (e.g. bridges or mines) would be removed or altered by the project. Effects to natural high capability reproductive habitats (e.g. caves and barren rocky areas) are not expected because the proposed project would not occur in these areas. Habitat quality is expected to improve in areas where dense understory vegetation is removed (pre-commercial thinning and fuels treatments) allowing for increased flight maneuverability and foraging opportunities.

Under the proposed action, oaks (which provide important roost sites) would be retained and growth will be enhanced by thinning of competing shade tolerant conifers. The proposed action targets the retention of oaks with an objective of increasing growth of the hardwood component within the treated stands. The proposed action would benefit the roosting habitat of the pallid bat by improving the health of oak stands within the project units. No reduction in habitat suitability is expected because habitat loss (e.g. even-aged stand management or vegetation type conversion) would not occur under the proposed action.

Fringed myotis habitat is limited within treatment units as they are most commonly found in open canopy habitat types, while the proposed action targets dense forest and plantations. Habitat is not expected to be reduced as a result of the proposed project due to the minimal effect the proposed canopy cover reduction, the retention and enhancement of hardwood stands, and the retention of the majority of large snags. The loss of bat roosts is unlikely as large snags, which are more likely to exhibit characteristics favorable for bat roosting, are targeted for retention by this project. Large snags that pose a safety hazard (e.g. to adjacent roads) and may be suitable for roosting could be removed, although removal of large snags would be incidental and would not substantially reduce large snag availability across the project units. No permanent, man-made structures that may support bat reproductive or roosting habitats would be removed or altered by the project.

Proposed treatments which reduce overstory canopy cover are not expected to affect habitat quantity or quality as the level of canopy reduction would not result in an open habitat type preferred by this species. Treatments that would remove understory cover such as pre-commercial thinning and fuels treatments may reduce foraging habitat quality for the short term as fringed myotis prefer dense understory cover for foraging.

Under the proposed action oaks (which provide important roost sites) would be retained and growth would be enhanced by the thinning of competing shade tolerant conifers. This prescription would retain oaks and thin adjacent conifers to improve the health and resilience of oaks. The proposed action would benefit the roosting habitat of the fringed myotis by improving the health of oak stands within the project units. No reduction in habitat suitability is expected as habitat loss (e.g. hardwood removal) would not occur.

Implementation of proposed action alternative is not expected to result in changes in the quantity of high and moderate capability fringed myotis reproductive, resting, or foraging habitats within the project area. Habitat quality would be increased in treated hardwood stands, but would be slightly reduced where large snags are removed and where understory cover was reduced.

Cumulative Effects

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 3,079 acres. Most vegetation management on federal lands within the analysis area in the past 20 years has been conducted utilizing uneven-aged prescriptions under either the CASPO Interim Guidelines (adopted in 1993) or SNFPA standards and guidelines (beginning in 2001). These commercial thinning prescriptions generally were “thinning from below,” aimed at removing understory trees in the suppressed and intermediate canopy classes and some co-dominant trees while retaining overstory trees and the largest trees in the treated stands. While the CASPO Interim Guidelines would have allowed removal of canopy closure below 40 percent in some thinned stands, this was a minor component of the overall thinning acreage. Most of the commercial thinning has been conducted under Sierra Nevada Forest Plan Amendment standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in generally the largest trees. Adherence to this management direction resulted in thinning treatments that reduced canopy closure and snag recruitment and increased fine scale fragmentation (e.g. increasing the number of temporary roads and landings), but also maintained existing habitats, and reduced the risk of adverse effects from high severity wildland fire.

Of the past projects that have occurred on forest land within the analysis area, treatments such as overstory removal (138 acres), and seed tree cuts (555 acres) are expected to have increased fringed myotis habitat quality by decreasing canopy cover while retaining the largest trees and snags. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 20 years. Of the area that burned, it is estimated that at least 60 acres experienced high severity fire. Of the suitable fringed myotis habitat that burned at high severity it is likely habitat quality and quantity increased through an increase in potential roost site availability (large snags) and decreased canopy cover though some hardwood habitat was lost. Past fire salvage which has occurred over approximately 716 acres of burned forest within the analysis area following the 2003 Codfish Fire, 2006 Ralston Fire, and 2008 Peavine Fire, and 2013 American Fire, retained at least four of the largest snags per acre. Suitable habitat within burned forests remained suitable for this species following fire salvage though habitat quality was reduced as a result of the removal of majority of large snags which is important roosting habitat for the fringed myotis. Hazard tree removal has occurred over 1,072 acres within the analysis area. Removing a minimal number of hazard trees is expected to reduce habitat quality as snags and large trees that could be used as roosting sites would be removed but would not reduce availability across the project units. Other past treatments, understory removal including pre-commercial thinning (3,701 acres), mastication (408 acres), thinning for fuels reduction (350 acres), and underburning (352 acres), occurring within the analysis area have likely decreased habitat quality, as thick understory stands may be preferred for foraging. Past commercial thinning treatments (1,829 acres) are not expected to have reduced quantity or quality of fringed myotis habitat.

Private land accounts for 9,879 acres or 26% of the analysis area. It is expected that private timber harvests have reduced the quantity of available habitat where timber harvests included hardwood and hardwood conifer stands. The quality of habitat was also reduced in fire salvaged areas that reduced large snags available for roost sites.

The effects of past actions can best be quantified by discussing what is present today. Although past actions on forest land are not expected to have reduced fringed myotis habitat, all past actions have added to the potential for disturbance to roost sites though these projects mostly occurred over the last 20 years which limits the suitable habitat that would be subject to disturbance on a yearly basis.

Present and reasonably foreseeable future actions occurring within the analysis area are detailed in the General Cumulative Effects section. The general effects of these projects are expected to result in various degrees of improvement of habitat conditions at the patch-scale, but overall project design standards would maintain suitable habitat for Townsend's big-eared bat at the stand or landscape scale. The proposed project would reduce canopy cover on 2,695 acres and the reasonably foreseeable future actions will reduce canopy cover over approximately 3,079 acres within the analysis area. Canopy cover reductions under these projects would improve habitat for fringed myotis but would not be substantial enough to affect habitat suitability. Pre-commercial thinning small diameter trees, typically <10 inch dbh, and fuels treatments would result in more open and homogeneous understory conditions for the short term that likely increase habitat quality for the Townsend's big-eared bat by decreasing understory density and increasing flight opportunities.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the fringed myotis.

Rationale:

- There is a possibility of disturbance to individual or colonies of fringed myotis during project implementation.
- Suitable habitat would be retained.
- Roost sites including rocks, cliffs, buildings, mines, and bridges would not be altered.
- Large snags would remain available throughout the project units.

WESTERN BUMBLE BEE

A. Existing Environment

The western bumble bee (*Bombus occidentalis)* is experiencing severe declines in distribution and abundance due to a variety of factors including diseases and loss of genetic diversity (Tommasi et al. 2004, Cameron et al. 2011, Koch et al. 2012). Historically, the species was broadly distributed across western North America along the Pacific Coast and westward from Alaska to the Colorado Rocky Mountains (Thorp and Shepard 2005, Koch et al. 2012) and was one of the most broadly distributed bumble bee species in North America (Cameron et al. 2011). The current range includes California and adjacent states. Six bumble bee occurrences are documented on the Tahoe National Forest prior to 2000 (www.xerces.org).

Bumble bees introduced from Europe for commercial pollination apparently carried a microsporidian parasite, *Nosema bombi*, which have spread to native bumble bee populations. Highest incidences of declining *B. occidentalis* populations are associated with highest infection rates with the *Nosema* parasite, and the incidence of *Nosema* infestation is significantly higher in the vicinity of greenhouses that use imported bumble bees for pollination of commercial crops (Cameron et al. 2011).

Although the general distribution trend is steeply downward, especially in the west coast states, some isolated populations in Oregon and the Rocky Mountains appear stable (Rao et al. 2011, Koch et al. 2012). The overall status of populations in the west is largely dependent on geographic region: populations west of the Cascade and Sierra Nevada mountains are experiencing steeply declining numbers, while those to the east of this dividing line are more secure with relatively unchanged population sizes. The reasons for these differences are not known.

Bumble bees are threatened by many kinds of habitat alterations that may fragment or reduce the availability of flowers that produce the nectar and pollen they require, and decrease the number of abandoned rodent burrows that provide nest and hibernation sites for queens. Major threats that alter landscapes and habitat required by bumble bees include agricultural and urban development. Exposure to organophosphate, carbamate, pyrethroid and particularly neonicotinoid insecticides has recently been identified as a major contributor to the decline of many pollinating bees, including honey bees and bumble bees (Henry et al. 2012, Hopwood et al. 2012). In the absence of fire, native conifers encroach upon meadows, which also decrease foraging and nesting habitat available for bumble bees.

According to studies done in England (Goulson et al. 2008), grazing during the autumn and winter months may provide excellent bumble bee habitat and prevent the accumulation of coarse grasses. Heavy grazing and high forage utilization can negatively impact bumble bees since flowering plants providing necessary nectar and pollen may become unavailable, particularly during the spring and summer when queens, workers and males are all present and active.

Queens overwinter in the ground in abandoned rodent (i.e. mouse, chipmunk or vole) nests at depths from 6-18 inches and typically emerge about mid-March. The queen then lays fertilized eggs and nurtures a new generation. She first creates a thimble-sized and shaped wax honey pot, which she provisions with nectar-moistened pollen for 8-10 individual first-generation workers when they hatch. The larvae will receive all of the proteins, fats, vitamins and minerals necessary for growth and normal development from pollen. Eventually all the larvae will spin a silk cocoon and pupate in the honey pot. The workers that emerge will begin foraging and provisioning new honey pots as they are created to accommodate additional recruits to the colony. Individuals emerging from fertilized eggs will become workers that reach peak abundance during July and August. Foraging individuals are largely absent by the end of September. Those that emerge from unfertilized eggs become males, which do not forage and only serve the function of reproducing with newly emerged queens. During the season, a range of 50 to hundreds of individuals may be produced depending on the quantity and quality of flowers available. When the colony no longer produces workers, the old queen will eventually die and newly emerged queens will mate with males and then disperse to found new colonies. During this extended flight that may last for up to two weeks she may make several stops to examine the ground for a suitable burrow. Mikkola (1984) reported that bumble bees may forage up to a distance of 80 kilometers (50 miles) in Finland (Heinrich 1979).

Where nesting habitat is scarce, bumble bee species having queens that emerge early (mid-March) in the season like *B. vosnesenskii* which co-occurs with the later emerging *B. occidentalis*, may be able to monopolize available nest sites and reduce the chances of success for bumble bee species emerging later.
Western bumble bees have a short proboscis or tongue length relative to other co-occurring bumble bee species, which restricts nectar gathering to flowers with short corolla lengths and limits the variety of flower species it is able to exploit. Western bumble bees have been observed taking nectar from a variety of flowering plants, including *Aster* spp., *Brassica* spp., *Centaurea* spp., *Cimicifuga arizonica*, *Corydalis caseana*, *Chrysothamnus* spp., *Cirsium* spp., *Cosmos* spp., *Dahlia* spp., *Delphinium nuttallianum*, *Erica carnea, Erythronium grandiflorum*, *Foeniculum* spp., *Gaultheria shallon*, *Geranium* spp., *Gladiolus* spp., *Grindelia* spp., *Haplopappus* spp., *Hedysarum alpinum*, *Hypochoeris* spp., *Ipomopsis aggregata*, *Lathyrus* spp., *Linaria vulgaris*, *Lotus* spp., *Lupinus monticola*, *Mentha* spp., *Medicago* spp., *Melilotus* spp., *Mertensia ciliata*, *Monardella* spp., *Nama* spp., *Origanum* spp., *Orthocarpus* spp., *Pedicularis capitata*, *P. kanei*, and *P. langsdorfii, P. groenlandica, Penstemon procerus*, *Phacelia* spp., *Prunus* spp., *Raphanus* spp., *Rhododendron* spp., *Salix* spp., *Salvia* spp., *Solidago* spp., *Symphoricarpos* spp., *Tanacetum* spp., *Taraxacum* spp., *Trifolium dasyphyllum, Trichostema* spp., *Trifolium* spp. and *Zea* spp. (Evans et al. 2008).

Unlike all other bees, bumble bees are large enough to be capable of thermoregulation, which allow them to maintain their foraging activities for longer periods of the day, but also to occupy regions with more extreme latitudes and temperatures compared to other bees (Heinrich 1979). Bumble bees may continue to forage when temperatures are below freezing even in inclement weather (Heinrich 1979).

CWHR forest vegetation types, tree size, and canopy cover are the primary metrics for western bumble bee habitat used for this analysis. Projected post-treatment habitat changes were derived from modeling changes to current CWHR types based on stand exam data. Meadows, riparian areas, and open habitat types are preferred by the western bumble bee as they provide concentrations of flowering plants.

Within the analysis area meadows and riparian areas are limited. Only one meadow is present (Elliot Meadow, approximately 16 acres). Open canopy forest is also limited within the analysis area. Within the previous 20 years approximately 3,629 acres of wildland fire occur within the analysis area. None of the burned areas occur within this project's treatment units.

B. Effects of the Alternatives

Direct Effects and Indirect Effects

Direct effects may occur and could include disturbance to foraging western bumble bees or nest colonies due to the removal of flowering shrubs and wildflowers during project implementation. Disturbance-type effects are expected to be short term and limited as preferred habitat (meadows and riparian areas) would not be treated under the proposed action. Disturbance would also be limited due to project implementation being spread over approximately 10 years which would reduce the amount of disturbance on any given year.

Areas proposed for treatment (2,737 acres) under the proposed action would be considered suitable, though preferred habitat (meadows and riparian areas) would not be treated under the proposed action. Preferred habitat that contains concentration of flowering plants such as riparian areas would not be treated as they are subject to a riparian buffer which would exclude treatments in riparian areas. Meadows which also provide preferred habitat for the western bumble bee are not present within treatment units and therefore would not be affected by the proposed project.

Proposed activities which reduce canopy cover such as commercial thinning and cable thinning would have very minimal effect on the western bumble bee because the level of canopy cover reduction proposed would only minimally increase the availability of flowering plants in most areas. Areas proposed for insect infestation treatments would remove canopy cover and increase flowering plant availability. The largest effect to the western bumble bee habitat would result from treatments that reduce ground cover and therefore reduce flowering plant availability for the short term. Multiple fuel reduction prescriptions are proposed that would reduce flowering plants, and nest availability in treated areas. Under the proposed alternative, 2,737 acres are proposed for ground fuels treatments (e.g. mastication, prescribed burning, pile burning). These treatments would temporarily reduce foraging and nesting habitat quality. Although there would be a reduction of flowering plants throughout the units, not all of the flowering plants or potential nest sites would be removed and treatments such as prescribed burning increase flowering plant availability shortly after treatment. The proposed acreages for ground cover reduction would not occur in a single year but over up to an approximately 10 year period. Spreading treatments over an extended timeframe would have much less of an effect on habitat because some treatment areas would recover before others are treated, leaving fewer acres with reduced habitat quality at any given time. Additional untreated areas such as riparian buffers (100ft from perennial streams, 50ft from intermittent streams, and 25ft from ephemeral streams) which are prevalent within treatment units would provide habitat and offer continued access to flowering plants. The proposed action would be expected to have a negative effect on western bumble bee habitat quality for a short period after project implementation then would slightly benefit habitat through increased foraging opportunities in areas with reduced canopy covers and areas that received prescribed burning treatments. Although habitat quality is expected to be reduced in the short term as a result of the proposed action, habitat suitability is expected to be maintained through the retention of flowering plants throughout treatment units.

Cumulative Effects

As described above, the spatial extent of the analysis area for the western bumble bee (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities. The analysis area is temporally defined to extend 20 years before and after the present; in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the Analysis Area have been completed on a total footprint of approximately 3,079 acres. Most of the commercial thinning has been conducted under Sierra Nevada Forest Plan Amendment standards and guidelines that require retention of at least 40 percent canopy closure and 40 percent of the basal area in generally the largest trees. Adherence to this management direction resulted in thinning treatments that reduced canopy closure and snag recruitment and increased fine scale fragmentation (e.g. increasing the number of temporary roads and landings), but also maintained existing habitats, and reduced the risk of adverse effects from high severity wildland fire.

Of the past projects that have occurred on forest land within the analysis area, treatments such as overstory removal (138 acres), seed tree cuts (120 acres), and commercial thinning (1,829 acres) are expected to have increased western bumble bee habitat quality by reducing overstory canopy cover which has increased flowering plant availability. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 20 years. Of the area that burned, it is estimated that at least 60 acres experienced high severity fire. Of the suitable western bumble bee habitat that burned at high severity it is likely habitat quality and quantity increased through an increase in foraging and nest site availability. Past fire salvage decreased flowering plant growth and recovery in the short term through soil disturbance caused during project implementation. Hazard tree removal has occurred over 1,072 acres within the analysis area. Removing hazard trees is not expected to have affected habitat suitability. Other past treatments focused on understory removal including pre-commercial thinning (3,701 acres), thinning for fuels reduction (350 acres) occurring within the analysis area have likely had minimal effects on habitat quantity and quality as canopy cover reduction was minimal and only incidental ground cover reduction was experienced through crushing with heavy equipment during project implementation. Ground cover including flowering plants was most heavily affected by fuels treatments including mastication (408 acres), and underburning (352 acres). Fuels treatments remove a portion of the ground cover from treatment units reducing the availability of flowering plants for the short term.

Private land accounts for 9,879 acres or 26% of the analysis area. Private timber harvests have increased western bumble bee habitat by reducing canopy cover and increasing the abundance of flowering plants. Fire salvage likely reduced the recovery and abundance of flowering plants for the short term through soil disturbance associated with project implementation, but the disturbed, open condition allowed for the rapid recovery of herbaceous flowering plants such as lupine, aster, clovers, and other preferred forage species.

The effects of past actions can best be quantified by discussing what is present today. Although past actions on forest land are expected to have reduced habitat quality for the short term, overall flowering plant availability is expected to have increased through the reduction in forest canopy cover mostly as a result of high severity wildfire.

Projects within the last 20 years, along with present and reasonably foreseeable actions on forest land have or would treat an estimated 9,879 acres or 26% of potentially suitable habitat within the analysis area. These past, present, and reasonably foreseeable actions have or would reduce habitat quality for the short term but maintain habitat suitability. Wildfire has by far had the largest effect on western bumble bee habitat as wildfires occurring over the past 20 years have burned approximately 3,629 acres or 10% of the analysis area with an estimated 60 acres experiencing high fire severity. Wildfires have likely increased habitat quality by decreasing forest canopy and increasing flowering plant establishment. The proposed project would occur over a footprint of 3,549 acres or 11% of the analysis area and would contribute to a reduction in habitat quality over the short term as there would be a reduction in flowering plant availability but is expected to maintain habitat suitability through retention of flowering plants throughout treatment units.

C. Conclusion and Determinations

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the western bumble bee.

Rationale:

- Habitat suitability would not be reduced through retention of flowering plants throughout treatment units.
- Habitat quality would be reduced through a reduction of flowering plant availability for the short term.

<u>Aquatic Species</u>

EFFECTS COMMON TO WESTERN POND TURTLE AND FOOTHILL YELLOW-LEGGED FROG

Attributes of Concern

Sediment: Ground-disturbing activities proposed for the Sunny South project have the potential for producing fine sediment which could wash into stream channels. Increases in fine sediment are considered, to varying degrees, to have potential for detrimental effects upon Western pond turtle and foothill yellow-legged frog

Increases in fine sediment can impact aquatic macroinvertebrate diversity and abundance, thus altering food availability for WPT's (Soroka and McKenzie-Grieve, 1983; Ryder, 1989; Ryan, 1991). The effect of sediment deposition on WPT adults, which typically inhabit perennial stream channels, is unclear.

Fine sediment can potentially smother FYLF frog egg masses, and increased water turbidity could restrict respiration for tadpoles in off-channel habitat. A study by Gillespie (2002) found that increased sediment loads in streams negatively impacted growth and development of spotted tree frog (*Litoria spenceri*) tadpoles, and could delay the amount of time required for tadpoles to metamorphose into frogs. Increases in fine sediment can also impact aquatic macroinvertebrate diversity and abundance, thus altering food availability for FYLF's.

The effect of sediment deposition on FYLF adults, which typically inhabit perennial stream and spring channels, is unclear. However, as findings from the Gillespie (2002) study indicate, egg masses and tadpoles may be affected by sediment. Egg masses, tadpoles, and subadult FYLF's are typically found in off-channel habitats. When adjacent stream channels flood and become hydrologically connected to these off-channel habitats, there is a risk of increased sedimentation of areas such as breeding pools. As the Gillespie (2002) study indicates, tadpole growth and development could be negatively affected.

Shade/Water Temperature: Stream channel shade is considered highly influential in regulating water temperature (Rutherford et al, 2004). Typically, buffer zones are placed along stream channel corridors that prohibit vegetation management activities near streams. One of the primary objectives of these buffers is to retain stream channel canopy cover. Many studies have analyzed the effects of implementing buffer zones of variable widths on stream temperatures, and the effects of vegetation management activities adjacent to stream channels (Brazier and Brown, 1973; Broadmeadow and Nisbet, 2004; Clinton et al., 2010; Macdonald et al., 2003; Moore et al., 2005). In general, these studies either found no significant change in stream temperatures following vegetation management within RCAs (Clinton et al., 2010), or found significantly elevated water temperatures following project activities (Brazier and Brown, 1973; Macdonald et al., 2003). The latter studies (Brazier and Brown, MacDonald et al.) found increased water temperatures only in study reaches where live conifers were clear-cut for 300-800 meters along the stream, only leaving riparian vegetation along the stream banks.

The vast majority of stream channel shade in the Sunny South project area is provided by adjacent vegetation. Thus, vegetation removal near stream channels would reduce shade cover and could lead to increased water temperatures as a result of increased sunlight exposure. Trees located within 100 feet of stream channels are considered to be more influential in providing stream channel shade than trees located beyond 100 feet (FEMAT, 1993). Therefore, analysis is focused upon vegetation management activities within 100 feet of stream channels when assessing effects upon stream channel shade.

Chemical Contaminants: A borate compound (borax) is often used as a fungicide for the prevention of annosus root disease. The compound is applied to cut stumps of live conifers at a rate of one pound of borate compound per fifty square feet of cut stump surface. Borate is partially soluble in water. The use of borate compound is being proposed to treat cut stumps of live trees within area salvage and hazard tree removal units. Thus, the toxicity of borax on aquatic organisms could be a concern.

A Pesticide Fact Sheet prepared for the Forest Service by Information Ventures, Inc. (2003), found that borax toxicity towards fish and aquatic macroinvertebrates is very low. The LC-50 (the concentration of substance in water which results in the death of fifty percent of a given organism) of borax for fish was found to exceed 1,000 parts per million (ppm). Aquatic water fleas exhibited a LC-50 of 133-226 ppm. The aforementioned values are acute, and not chronic, values of toxicity, as borax has not been shown to bioaccumulate in aquatic organisms (Information Ventures, Inc., 2003). When categorizing the toxicity of borax towards aquatic organisms, it was determined that borax falls under the Toxicity Category of 'practically non-toxic' (Information Ventures, Inc., 2003).

There are few studies on the effects of borax on reptiles and amphibians. An Ecological Risk Assessment prepared for the USFS by Syracuse Environmental Research Associates (SERA), Inc. (2006) references a study using larval leopard frogs (*Lithobathes pipiens*). The study found a LC-50 of approximately 47 ppm for leopard frog tadpoles exposed to borax for 7.5 days. Researchers in the aforementioned study concluded that borax toxicity is relatively low for leopard frogs.

Effects to Sediment: Ground-disturbing activities within RCAs are the most likely actions to produce sediment which could enter perennial waters and thus affect WPT and FYLF, or their potentially suitable habitat. Project activities taking place in upland (non-RCA) habitat may also contribute sediment to perennial waters.

Management requirements for the Sunny South project were developed under the assumption that all potential suitable habitats may be occupied by WPT and FYLF. Descriptions of RCA-specific management requirements can be found in the Management Recommendations section of this document. In general, RCA-specific MMR's were designed to minimize ground-disturbing actions within RCAs while meeting project objectives.

Implementation of the proposed action will follow management requirements described in the Sunny South Project Riparian Conservation Area (RCA) Guidelines. Management in RCAs will be consistent with Riparian Conservation Objectives (RCOs) and Aquatic Management Strategy (AMS) goals (USDA 2004) and the Land

and Resource Management Plan for the Tahoe National Forest, as amended (USDA 1996). The intent of management direction for RCAs is to (1) preserve, enhance, and restore habitat for riparian- and aquatic-dependent species; (2) ensure that water quality is maintained or restored; (3) enhance habitat conservation for species associated with the transition zone between upslope and riparian areas; and (4) provide greater connectivity within the watershed. Additionally, proposed vegetation management, with the exception of prescribed fire (burn piles are not included in this exception), and ground-disturbing changes in the transportation system will not occur within 300 feet of suitable habitat (e.g. intermittent or perennial streams, ponds, springs, and seeps) for California red-legged frog (a proxy for northwestern pond turtle habitat) during the wet season (defined as starting with the first frontal rain system that deposits a minimum of 0.25 inches of rain after October 15 and ending April 15).

Table 12. Width of riparian conservation areas (RCAs) by type

Type of RCA	Width of RCA, from edge of feature (feet)
Perennial stream	300
Seasonally flowing stream	150
Lakes, wet meadows, bogs, fens, wetlands, vernal pools, springs	300

An estimated 66.8 acres of vegetation treatments in the riparian conservation area, equivalent to approximately 5 percent of the suitable habitat (66.8 acres of 1,229 acres), may occur under the proposed action (Table 13).

Table 13. Vegetation treatments within 300 feet of WPT and FYLF habitat.

Subwatershed	Total Acres of RCA within Sunny South Project Boundary	Acres of Riparian Conservation Area Proposed for Treatment	
		Perennial/ Intermittent	
		Whole Tree Yarding and Underburn	Underburn Only
Peavine Creek-North Fork Middle Fork American River	98.02	98.02	0.0
Upper Shirttail Canyon	1,016.95	973.51	43.44
Volcano Canyon-Middle Fork American River	114.59	114.59	0.0
TOTAL	***1,229.56***	***1,186.12***	***43.44***

Vegetation treatments (i.e. thinning, removal of insect infested trees, hazard tree removal, rust resistant sugar pine protection, and underburning) would reduce tree and shrub cover on up to 26.9 acres within 100-300 feet of perennial streams and 50-300 feet of intermittent streams, making these areas slightly warmer, drier, and less suitable for WPT and FYLF dispersal, until new growth offsets and replaces lost cover over the 20-years following implementation. Cover immediately adjacent to suitable habitat would be reduced to a lesser extent given implementation of riparian buffers (25/50/100 feet). Temporary roads necessary to implement thinning activities would not be constructed in RCAs and, therefore, would not affect WPT and FYLF habitat. Pile burning and underburning would follow Sunny South Project RCA guidelines (e.g. no burn piles permitted within 100 feet of perennial water sources; USDA 2013b). Pile burning would result in patchy increases in soil hydrophobicity and potential nutrient transport within RCAs in the short term but, because of spatial buffers between piles and aquatic habitats, is not expected to affect suitable habitat (e.g. water quality would not be reduced). Prescribed burning is not expected to affect suitable habitat with the exception of where fire backs into riparian zones, which is expected to be slightly beneficial over the long term given the low severity of prescribed burning typical in riparian areas at the project elevation and that the ecosystem generally is fire-adapted. Rust resistant sugar pine protection is expected to have a negligible effect to WPT/FYLF habitat as only 2 acres would be treated and cover from the protected trees would remain. Hazard tree removal is expected to be sporadic across the landscape rather than relatively continuous like a thinning treatment. As such, hazard tree removal is expected to have a negligible to very slight effect on suitable habitat. Masticated, chipped (removed for biomass or spread on site), or lopped and scattered materials are expected to have a negligible effect on suitable habitat. Fuel reductions associated with thinning and follow-up treatments (e.g. chipping, mastication, and pile burning) are expected to reduce the potential for severe wildland fire effects to unoccupied, suitable habitats in and adjacent to the project area for an estimated 20 years, with the greatest reduction in potential effects in the first few years following treatment (prior to re-growth of ladder fuels in the understory).

Two treatments, hazard tree removal and prescribed burning would occur within the RCA and riparian buffer zones. Hazard tree removal would only occur incidentally within suitable habitat and therefore would not affect overall habitat quality and quantity. Prescribed fire would be allowed to back into riparian areas slightly detrimentally effecting habitat in the short term, causing a reduction of ground vegetation in riparian areas, and beneficial in the long term, allowing emergent vegetation to replace decadent vegetation. Approximately 300 acres of prescribed fire occurs on a yearly basis within the 235,700 acre American River Ranger District. Of the 300 acres of underburning that occurs each year a small percentage will effect riparian vegetation. Due to the small number of acres of suitable habitat that will be effected each year and the quick regrowth following underburning, prescribed fire is expected to have a slightly detrimental short term effect, and a beneficial long term effect.

Outside of RCAs, mechanical treatments would occur. The type of equipment being used is another consideration when assessing potential ground disturbance by mechanical equipment operation. Mastication treatments produce large amounts of groundcover as they break down brush and small trees, often leaving more groundcover after treatment than was present prior to treatment. One would expect very little soil erosion resulting from mastication.

In summary, project activities would have a negligible to low risk of sedimentation of suitable habitat for WPT and FYLF.

Effects to Shade/Water Temperature: Reductions in stream channel canopy cover can potentially lead to increased water temperatures, particularly in the mid- to late-summer months when temperatures are high and water levels begin to recede as snowmelt declines. With approximately 66.8 acres of treatments proposed within RCAs, reductions in canopy cover becomes a concern. However implementation of the Sunny South project is expected to have a negligible effect upon water temperatures in project-area subwatersheds.

Reductions in canopy cover over seasonal stream channels would essentially have no effect on water temperature, as these channels are usually devoid of water by mid-summer. Therefore, emphasis of analysis is placed upon RCAs with perennial waters. In addition, only the inner 100 feet of perennial RCA treatments are analyzed for stream channel canopy cover, as trees within this area are more influential in providing canopy cover than trees outside of this range (FEMAT, 1993). The aforementioned Forest Ecosystem Management Assessment Team (FEMAT) (1993) describes trees within 100 feet of stream channels as being more influential in providing canopy cover than trees outside that range. Depending on topography, trees between 100-150 feet beyond the stream channel may have influence upon stream channel shading (i.e., steep hill slopes would result in trees further away from stream channels providing more shade over the channel, versus trees located on flat terrain adjacent to a stream channel). Table 13, above summarizes acres of perennial riparian buffer treatments according to subwatershed which would potentially influence stream channel canopy cover.

As Table 13 above shows, relatively small amounts of inner zone stream riparian buffers would be affected, and are associated with prescribed burning and hazard tree removal. As stated in the proposed action for this project, tree felling in RCAs would only involve the felling of hazard trees. Because hazard tree removal is expected to consist of scattered, individual trees, and because the identified roadside hazard tree areas only affect a small portion of the riparian buffers, the felling of hazard trees within perennial stream riparian buffers of the Sunny South project area may have a negligible, localized effect upon stream channel canopy cover, and thus would be unlikely to change water temperatures within potentially suitable habitat for WPT and FYLF.

There are few acres of treatment along perennial streams inside the riparian buffer, and there will be minimal disturbance to soils on these steep slopes, and remaining snags will provide large woody debris (LWD) recruitment to the streams. In addition these trees will provide shade, retention of water and moisture on site, soil and bank stability, and have a positive effect on the micro-climate within the RCAs specifically within the riparian buffer. With implementation of the project management requirements and BMPs discussed above, there would be nominal indirect effects to the WPT and FYLF or their potential habitat within the Sunny South project by the proposed actions.

Indirect effects to suitable habitat occurring within the analysis area may occur in the short term as a result of prescribed fire slightly reducing ground cover in suitable habitats.

Effects from Contaminants: Under the proposed action tree removal would only occur within RCAs in the case of hazard tree removal, therefore application of borax within RCAs (and therefore WPT and FYLF habitat) would occur sporadically. Additionally, since borax has been shown to be only very slightly toxic to fish and herpetofauna in large doses, no effect is expected as a result of borax use.

WESTERN POND TURTLE

A. Existing Environment

SNFPA standards and guidelines for Riparian Conservation Areas, listed under California red-legged frog, provide for the needs of the western pond turtle.

The western pond turtle (WPT) is found on the west coast of North America. Historically it was found from as far north as British Columbia, Canada to as far south as Baja California, mostly west of the Cascade-Sierra crest (Lovich and Meyer 2002). Fossil fragments have been found east of the current range indicating that the species was once more widespread (Buskirk 2002). Disjunct populations have been documented in the Truckee, Humboldt and Carson Rivers in Nevada, Puget Sound in Washington, and the Columbia Gorge on the border of Oregon and Washington. It is currently unclear if these are remnant or introduced populations (Lovich and Meyer 2002). Modern distribution is limited to parts of Washington, Oregon, California and northern Baja California (Buskirk 2002). Western pond turtles are the only native aquatic turtle in California and southern Oregon, in the northern part of its range it coexists with only the western painted turtle (Chrysemys picta bellii) (Germano and

Rathbun 2008). On Region 5 lands this turtle can be found on all National Forests, except the Inyo and Lake Tahoe Basin.

The Society for the Study of Amphibians and Reptiles no longer recognizes subspecies for the western pond turtle. Presumably this is based on recent genetic work that indicates that the recognized subspecies were not geographically or genetically distinct, and the currently recognized species likely represents as many as four cryptic species. However, the study that identified the four distinct clades of pond turtle did not elevate any to species status because the authors wanted to wait until further molecular work was undertaken. The two former subspecies were the northwestern pond turtle (*Emys marmorata marmorata*) and the southwestern pond turtle (*Emys marmorata pallida*) with a subspecies split along the transverse mountain range in southern California (Spinks and Shaffer 2005).

The western pond turtle inhabits a Mediterranean climate defined by mild, wet winters and long hot, dry summers. In the northern portion of its range winters are colder with more rainfall than in southern areas (Germano and Rathbun 2008). Aquatic habitats include lakes, natural ponds, rivers, oxbows, permanent streams, ephemeral streams, marshes, freshwater and brackish estuaries and vernal pools. Additionally, these turtles will utilize man-made waterways including drainage ditches, canals, reservoirs, mill ponds, ornamental ponds, stock ponds, abandoned gravel pits, and sewage treatment plants (Buskirk 2002). Turtles captured at waste-water treatment plants grew quickly, had successful recruitment and produced large clutches (Germano 2010). Turtles favor areas with offshore basking sites including floating logs, snags, protruding rocks, emergent vegetation and overhanging tree boughs, but also will utilize steep and/or vegetated shores. Hatchlings additionally require shallow, eutrophic, warm areas which are typically at the margins of natural waterways (Buskirk 2002). Terrestrial habitats are less well understood. In southern California animals spend only one to two months in terrestrial habitats while animals in the northern portions of the range can be terrestrial for up to eight months (Lovich and Meyer 2002). Animals have been documented to overwinter under litter or buried in soil in areas with dense understories consisting of vegetation such as blackberry, poison oak and stinging nettle which reduces the likelihood of predation (Davis 1998).

Turtles move upland at different times across the range of this species. Animals can move upland as early as September, but typically move following the first winter storm in November or December. Not all animals move upland, some move to nearby ponds for the winter (Davis 1998). Animals have been observed moving underneath ice in ponds and potentially congregate in shallow areas (Buskirk 2002). Upland animals remain somewhat active throughout the winter and can be observed basking on warm winter days (Davis 1998). Upland movements for both overwintering and reproduction typically occur in the afternoon and evenings. Walkabouts to scout for nest sites can be completed within one day or they can last up to four days (Crump 2001). Home ranges differ between males and females with male home ranges averaging 0.976 hectares (2.4 acres) and females averaging 0.248 hectares (0.6 acres). Although western pond turtles are likely not territorial, disputes over basking sites are commonly observed (Buskirk 2002).

Population abundance has been well studied in this species. In some stream habitats densities can exceed 1,000 turtles per hectare. In Oregon, small ponds can hold over 500 turtles per hectare (2.5 acres). These densities represent extremes with typical densities ranging from 23 to 214 turtles per hectare (2.5 acres) throughout most of the range (Lovich and Meyer 2002). Capture rates at one site in southern California were approximately 2 to 2.6 turtles per trap night (Germano 2010). These density estimates are likely accurate for populations on National Forest System lands where habitat is suitable.

Western pond turtles are generalist omnivores and have been documented eating a wide variety of prey. Prey items include larval insects, midges, beetles, filamentous green algae, tule and cattail roots, water lily pods, and alder catkins (Germano 2010). Filamentous algae is considered to be an important food source for females after egg laying (Buskirk 2002). Additionally, animals will opportunistically feed on other items such as floating duck carcasses, ducklings (pers. obs.) and dog food in backyards while on walkabouts (Buskirk 2002).

Local climatic and water level variations can alter the timing of nesting in this species (Crump 2001). The nesting season is from late April through mid-July at low elevation, and June through August at higher elevations (Scott et al. 2008). Although some females can reproduce with a carapace length as small as 111 millimeters (4.4 inches), 120 millimeters (4.7 inches) is the minimum reproductive size in most areas with most gravid females being 140 millimeters (5.5 inches) or larger (Scott et al. 2008). Animals of this size are often at least seven years old in southern areas and eight to twelve years old in northern areas. Western pond turtles have an average life expectancy of approximately forty years if they survive to adulthood (Buskirk 2002).

Some western pond turtles have shown nest site fidelity. Four of five detected nesting areas in one study area had instances of nest side fidelity. It is likely that nest site fidelity is common, and sites are changed only after a negative encounter during either a walkabout or while forming a nest at a particular site (Crump 2001). Most females nest within 50 meters (164 feet) of water; however some females nest upwards of 400 meters (0.25 miles) away from water (Lovich and Meyer 2002). It is believed that in coastal populations nesting occurs far from water in order to protect overwintering hatchlings from being injured during winter floods (Lovich and Meyer 2002).

Hatchlings in the Mojave River population overwinter in the nest and emerge as early as March of the following year (Lovich and Meyer 2002). However, most hatchlings in southern California emerge in late fall of the year they were laid. Northern animals typically emerge the following spring. Delayed emergence can be caused by soil structure where sandy soil results in earlier emergence (Crump 2001). Microhabitat use, behavior and diet differ between juvenile and adult western pond turtles (Lovich and Meyer 2002). Little is known about the specific requirements of hatchling turtles as they are cryptic and are rarely represented in population assessments of many species including those with known stable populations (Germano and Rathbun 2008).

Growth and maturation in western pond turtles is heavily influenced by ambient air and water temperatures and basking behaviors which include aerial basking, and cryptic behaviors such as burying in warm sand or lying in warm algal mats (Germano and Rathbun 2008). Sites with cold water require turtles to bask more, causing average body size to be smaller compared to sites with warmer water. Areas which have higher invertebrate densities (typically classified as having organic mud bottom substrates) yield larger turtles (Lubcke and Wilson 2007).

Western pond turtle populations have significantly declined with many populations representing less than 10% of the historic population. In California alone there has been a loss of 80-85% of western pond turtles since the 1850's. Ninety eight percent of the population is gone in Oregon's Willamette Valley, 95-99.9% of the population in the San Joaquin Valley is gone and most of the Nevada populations have disappeared. In southern California there are only 12 known viable populations (>25 adult animals) between Los Angeles County and the Mexican border (Buskirk 2002).

The major threat to this species is habitat loss or degradation. Most of the historical habitat for this species has been permanently lost as a result of development for human occupancy. Riparian and wetland habitats were cleared for agriculture use, channelized and stripped of vegetation, or invaded by the saltcedar shrub which destroys water quality, alters stream structure and dries streams. Ground water pumping lowers water tables and further stresses riparian plant communities. Gold and gravel mining can both directly destroy habitat as well as introduce toxins through toxic spills and illegal dumping of chemicals (Buskirk 2002; Lovich and Meyer 2002).

Additional human-caused threats further jeopardize population viability. Cattle grazing damages and reduces riparian habitat, cattle can trample and kill turtles and nests, and cattle waste pollutes waterways. Western pond turtles, especially gravid females, are easily killed on roadways by direct impact with vehicles. Historically turtles were also collected for the pet trade, with hundreds of animals from a single site being exported to Europe in the 1960's. Although collection and sale of western pond turtles have been banned for many years, animals are still listed for sale in the eastern United States. Turtles were also collected for food in great numbers from the mid-19th century to the 1930s when they first started to become scarce. Modern watercourse recreation also impacts pond turtles.

Disease poses a notable threat to western pond turtles, as has been seen in Washington. A die-off in 1990 was attributed to a syndrome similar to an upper-respiratory disease. Several years later, as part of a head-starting program, several animals were found dead with no apparent cause of death (Vander Haegen et al. 2009). Animals from a wastewater treatment pond in California were found to be less healthy in both the short and long term compared to animals in a natural habitat despite being larger in size. Although larger, these animals had more chronic stress in the form of more interactions with humans and invasive species, increased water pollution and greater exposure to water-borne diseases (Polo-Cavia et al. 2010). Dehydration also poses a threat to turtles under a year old which likely makes these animals more susceptible to disease (Vander Haegen et al. 2009).

In addition to threats that affect entire populations, many populations are failing as a result of extremely high juvenile mortality. While adults may have annual survival rates of 95-97%, nests, juveniles and sub-adults have extremely high mortality rates (Vander Haegen et al 2009). Nest destruction by raccoons can approach or reach 100% of nests at many Oregon nest sites (Buskirk 2002). Nests are also destroyed when exposed to too much moisture or are crushed by cattle or machines. There are many predators of hatchling turtles, including two very successful non-native predators- large-mouth bass and bullfrogs. Subadult mortality can be as high as 85-90% annually for animals under 4 years old, however head-started subadults had mortalities as low as 10% when carapace length was greater than 90mm (3.5 inches). Natural predators that have been documented to take sub-adult turtles include: raccoons, coyotes, black bears and western river otters with most predations occurring while the animal was terrestrial (Vander Haegen et al. 2009). Adults face less predation risk. A study documented one predation of an adult turtle by a loon, and only 3 of 196 turtles had evidence of predation attempts such as shell or limb damage (Davis 1998).

Few turtle surveys have been conducted in the Tahoe National Forest. Primarily, western pond turtle observations have been made during aquatic surveys or other forest activity surveys. California Academy of Sciences, San Francisco, has conducted herpetological surveys including areas likely to provide habitat for pond turtles (1997, 1998, and 1999). In 2008, Placer County Water Agency submitted a Special-status Amphibians and Aquatic Reptiles Technical Study Report as part of the Middle Fork American River Project (FERC Project No. 2079) (PCWA 2008). Incidental observations were recorded during surveys for other aquatic species in 2007 (no formal western pond turtle surveys were conducted). A total of eight observations of western pond turtles were made; six of these were in the Middle Fork American River or its tributaries, downstream of Ralston Afterbay and two observations were in the North Fork American River. Western pond turtles have been observed at over 30 locations within the Tahoe National Forest boundary. Most of the observations have been associated with pond habitats, although several observations were of turtles in upland areas (e.g. turtle walking across a road). Table 14 below summarizes the area (in miles and/or acres) of potential suitable habitat for this species within the Sunny South Insect Treatment project area.

Potential habitat for the western pond turtle has been identified throughout the Sunny South Insect Treatment project analysis area in perennial and intermittent streams and water bodies; however, these streams are not known to be occupied. Within the analysis area there is a total of 7.8 miles of perennial stream channels that may provide suitable western pond turtle habitat. In addition there are 2.4 miles of intermittent stream habitat that could be used for dispersal and migration corridors. There are also 217 acres of waterbodies and springs that provide habitat for the western pond turtle. Table 14 below summarizes the total acres of RCA habitat for the western pond turtle within the Sunny South project area. The treatable column represents the amount of RCA habitat outside the riparian buffer.

No sightings of western pond turtles occur within the project area. The nearest western pond turtle (WPT) sighting to the project area are the six detections downstream of Ralston Afterbay, approximately 1.5 miles south of this project area. This site is within the same subwatershed the Seed Plantation sections of this project. Since there is a lack of western pond turtle surveys in the project area management requirements were developed under the assumption that all potential suitable habitats may be occupied by the western pond turtle.

Table 14. Suitable Western Pond Turtle habitat in RCA and Riparian Buffer.

Sunny South Project	RCA (acres)		Riparian Buffer (acres)	
	Perennial	Intermittent	Perennial	Intermittent
Project Boundary	17.3	9.6	87.4	18.9
WPT Potential Suitable Habitat	17.3	9.6	87.4	18.9

B. Effects

The spatial extent of the analysis area for Western pond turtle (38,125 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities, under the proposed action, in correlation with the spatial extent of Western pond turtle home ranges. Further, the analysis area was delineated to encompass habitat that Western pond turtles might use, but not so large as to potentially mask effects on WPT habitat from the Sunny South Insect Treatment project.

Direct Effects

There would be a negligible risk of direct effects upon WPTs, or their habitat, resulting from activities proposed. There are four potential scenarios in which WPTs could be directly affected by project activities. These scenarios include 1) turtles coming into direct contact with mechanical equipment, 2) tree falling upon individual turtles, 3) exposure and subsequent sickening of WPTs from borate compound used to treat live cut stumps of conifers, and 4) juvenile and adults coming into contact with water drafting equipment. These scenarios are described in more detail below.

Western pond turtle nests have been found as far as 400 meters from a water body (Reese and Welsh 1998) in open sunny areas on hill slopes, generally with a south to southwest facing aspect. The majority of nest sites discovered to date have been found on dry, well-drained soils with increased amounts of clay and silt and gentle slope (less than 15 degree slope). The nests found were dominated by grasses or annuals with few shrubs or trees in the vicinity thus skid roads or small plantations can be ideal for nesting or estivating. There is potentially suitable turtle habitat throughout the project area, but as described above the species is primarily found below 6,000 feet in elevation. However, because the predominance of trees to be harvested will be outside of the RCAs, and with the application of BMPs and MMR's there should be nominal potential direct effects to turtles and their potential habitat. The limited operating period (LOP) for CRLFs from October 15th through April 15th will prevent all mechanical operations from occurring within 300 feet of suitable habitat. These management requirements will minimize the potential for individual WPTs from coming into contact with mechanical equipment.

In addition, the Sunny South project would not be implemented until soils were considered dry enough for project activities (TNF Wet Weather Operation Guidelines). Since project activities would not occur during wet soil conditions when WPT could likely to be traveling overland, there would be no risk of mechanical equipment coming into contact with individual WPTs.

The use of borate compound (otherwise known as borax) is proposed for cut stumps of live conifers greater than 14 inches diameter within hazard tree and area salvage treatment units (See Sunny South Project Management Requirements). Although no research has been conducted to assess the effects of borax upon WPTs, a study using larval leopard frogs (*Rana pipiens*) found borax toxicity is relatively low (SERA, 2006). Studies of borax toxicity upon other aquatic organisms deemed borax to be “practically non-toxic” (Information Ventures, Inc., 2003). Although borax toxicity is considered to be low, mitigations would still be in place to prevent borax from entering watercourses and potentially affecting aquatic habitats. Application of borate compound in the Sunny South project will insure for direct application to stumps within 25 feet of perennial or intermittent streams, meadows, and special aquatic features. Application of borax will cease if there is sustained rainfall, to avoid misapplication and runoff. Given the above information on the toxicity of borax and mitigation measures, the application of borate compound to live cut stumps within the project area would have a negligible risk of affecting WPT or suitable habitat.

Summary of Direct Effects

In summary, implementation of the Sunny South project would have low risk of directly affecting WPTs through contact with mechanical equipment or felling of trees, and a negligible risk of poisoning by the use of borate compound.

Indirect Effects

Implementation of the Sunny South project would pose a negligible to low risk of indirect effects upon WPT individuals, or suitable habitat. Limited ground-based mechanical treatments would occur within RCAs of subwatersheds considered to have suitable habitat for WPT. Management requirements to minimize sediment production and transport to adjacent stream channels would be implemented within upland (non-RCA) ground-based mechanical equipment units. Since very little ground disturbance would occur within RCAs, these RCAs would also act as buffers to aid in filtering out any sediment that is potentially produced in upland treatment areas before it could reach stream channels. The felling of hazard trees in RCAs would have a negligible impact upon water temperatures within perennial and seasonal streams, as only a small percentage of the total available RCA habitat would be treated.

WPT habitat is expected to remain suitable (i.e. water quality and riparian habitat would be improved and minimum in-stream flows would be maintained). An estimated 66.8 acres within 300 feet of habitat distributed across the project area may be affected. Tree and shrub thinning would result in slightly warmer and drier conditions between 100-300 feet of perennial streams and 50-300 feet of intermittent streams and slightly reduce habitat suitability for WPT dispersal in these areas primarily over the short term. Underburning fires that back into riparian areas would be slightly detrimental to habitat suitability over the short term, but slightly beneficial over the long term. The risk of adverse effects from a high severity wildland fire would be reduced, especially in the short term.

Thinning is expected to reduce the density of vegetation and related water uptake and evapotranspiration losses, but these changes are not expected to affect (e.g. increase water quantity in) perennial or intermittent aquatic habitats unless annual precipitation exceeds water uptake in treated stands and only until water uptake and losses from re-growth match available water; the beneficial effect is expected to be slight to non-measurable and last only through the short term. Pile burning would also follow RCA guidelines (e.g. no burn piles permitted within 100 feet of a perennial water sources; and is expected to result in patchy increases in soil hydrophobicity and potential nutrient transport in portions of RCAs in the short term. However, because of the spatial buffers between burn piles and aquatic habitats, effects to habitat suitability (e.g. water quality) are expected to be negligible in the short and long term. Prescribed burning is not expected to affect suitable habitats in the short or long term with the exception of where prescribed fire backs into riparian zones and results in long term increases in riparian and herbaceous ground cover and concomitant slight increases in water quality and stream shading. Mastication and chipping (removed for biomass or spread on site) are expected to have a negligible effect (e.g. to water quality or quantity) to suitable habitats. Hand cutting and/or lop and scatter activities are also expected to have a negligible effect (e.g. to soil and/or nutrient transport) on suitable habitats. In summary, the effects of proposed vegetation management activities under the proposed action to suitable habitats are expected to be negligible to slightly positive over the short and long term overall.

Changes in the permanent transportation system are expected to be slightly beneficial overall to aquatic habitats over the long term. Decommissioning an estimated 8.49 miles of non-system roads is expected to result in slight benefits as anthropogenic impacts (e.g. vehicle traffic) in these areas would be reduced and habitat quality would improve (e.g. reduced effects to soils and increased vegetative cover). New skid trails, temporary roads (estimated 2.5 miles of new temporary roads and 4 miles of temporary roads reconstructed on the existing road prism), and landings would not be constructed within RCAs (unless an alternative does not exist); effects to aquatic habitats are not expected because of the distances between new skid trails, roads, and landings and perennial and intermittent aquatic habitats, and Sunny South Project RCA guidelines (e.g. restrictions on the timing, locations, and types of equipment that may be used).

Fine scale habitat fragmentation is not expected to result from implementation of the proposed action for this species. The construction of temporary roads and landings is expected to result in a negligible effect to the western pond turtle. Coarse scale habitat fragmentation is not expected to be affected as the quantities of reproductive, resting, and foraging habitats would not change. Connectivity between large tracts of habitats would be retained under both project alternatives. Habitat connectivity at the landscape scale is expected to be preserved at a level equivalent to the existing condition. Risk of coarse scale fragmentation from wildland fire (e.g. the 2013 American Fire) or large scale pathogen-induced stand mortality would be reduced in treatment areas. Also, given climate change as described above for all species, no new barriers to western pond turtle movement or distribution are expected to be created by the implementation of the proposed action.

Summary of Indirect Effects

The two risks associated with project activities which may indirectly affect WPTs or their potentially suitable habitat include 1) increased sedimentation of potentially suitable habitat as a result of ground disturbance, and 2) reductions in canopy cover within potentially suitable habitat as a result of tree felling within RCAs, which could lead to increased water temperatures. It has been determined that activities under the proposed actions would have a negligible to low risk of sedimentation of stream channel and off-channel habitat, and a negligible risk to changes in canopy cover.

Although analysis of effects is focused upon treatments within RCAs that are hydrologically linked to potentially suitable habitats, proposed vegetation management activities outside of RCAs have the potential for exposing bare mineral soil and destabilizing hill slopes. These effects can, in turn, result in increased sedimentation of stream channels located downhill from upland treatments. Descriptions of RCA-specific management requirements can be found in the Management Requirements section of this document. In general, RCA-specific MMRs were designed to minimize ground-disturbing actions within RCAs while meeting project objectives.

Indirect effects to suitable habitat occurring within the analysis area may occur in the short term as a result of prescribed fire slightly reducing ground cover in suitable habitats.

Cumulative Effects

As described above, the spatial extent of the analysis area for WPT (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities. The analysis area is temporally defined to extend 20 years before and after the present; in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 3,079 acres.

Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (1,829 acres) and seed tree cut (555 acres) may have caused warming within RCA habitat by removing canopy cover. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 50 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable WPT habitat that was burned at high severity it is likely that most was rendered unsuitable. Hazard tree removal has likely occurred along roads and in recreation areas. Removing a minimal number of hazard trees is not expected to reduce overall canopy cover or tree size class and therefore would maintain habitat suitability but slightly reduce habitat. Non-public lands account for 9,879 acres or 26% of the analysis area. Private timber harvests and fire salvage likely caused a warming of RCA habitat due to less shade.

The effects of past actions can best be quantified by discussing what is present today. Although past actions on forest land are expected to have reduced habitat quality for the short term, overall flowering plant availability is expected to have increased through the reduction in forest canopy cover mostly as a result of high severity wildfire.

Past actions have had slightly beneficial to slightly detrimental effects to potentially suitable habitat in the analysis area. With the possible exception of wildland fire suppression, current actions are not expected to affect potentially suitable WPT habitat. Reasonably foreseeable future actions are not expected to affect or are expected to result in effects similar to the proposed action. Wildland fire suppression has permitted fuels to accumulate and the threat of detrimental effects to non-breeding habitat from a potential high severity wildland fire to persist. The proposed action is expected to result in slight warming and drying of approximately 66.8 acres within 100-300 feet of perennial streams or 50-300 feet of intermittent streams from thinning. Prescribed burning (i.e. fire backing into riparian habitat) would occur on the majority of thinned acres and would result in slightly detrimental effects in the short term and slightly beneficial effects over the long term. Habitat would remain suitable under the proposed action. The risk of detrimental effects to habitat from high severity wildland fire would be reduced under the proposed action. Cumulative effects from past, present, and reasonably foreseeable future projects to suitable habitat are the increased drying and warming of approximately 66.8 acres that have been thinned and burned (acres overlap) and reduced risk of severe wildfires on all treated acres.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the western pond turtle within the planning area of Tahoe National Forest.

Rationale: There is a very low chance of disturbance to individual western pond turtles during project implementation; habitat suitability would be retained and adverse cumulative effects would not occur.

FOOTHILL YELLOW-LEGGED FROG

A. Existing Environment

Standards and guidelines for Riparian Conservation Areas provide management direction for foothill yellow-legged frog and are described in the SNFPA ROD (January 2004).

Foothill yellow-legged frogs have suffered significant population declines across the majority of the known range. Historically this frog was found across most of southwestern Oregon west of the Cascade Mountains crest, south through California to Baja California (Fellers 2005; Jennings and Hayes 1994). Specimens collected from the Sierra San Pedro Martir of Baja California in 1961 were lost in transit and represented a population almost 300 miles south of the nearest known population (Loomis 1965). The foothill yellow-legged frog is currently found in most of northern California west of the Cascade Mountains crest, in the Coast Ranges from the California-Oregon border south to the Transverse Mountains in Los Angeles County and along the western slope of the Sierra Nevada Mountains south to Kern County. Isolated populations have been reported from the San Joaquin Valley and the mountains in Los Angeles County. This frog can be found from near sea level to 1,940m (6,370 ft.) where habitat is suitable (Morey 2000). Within Region 5 this frog is found on, or could occur on, all national forests except for the Cleveland, Inyo, Modoc, and Lake Tahoe Basin National Forests.

Populations of foothill yellow-legged frogs in the Pacific Northwest are considered to be the most stable with approximately 40% of streams occupied, 30% are occupied in the Cascade Mountains, 30% in the south Coast Range south of San Francisco and 12% in the Sierra Nevada foothills (Fellers 2005). Populations in and south of the Tehachapi Mountains have probably been extirpated (Santos-Barrera et al. 2004). The last verifiable record from this area is a series of animals which were collected in 1970, however unverifiable observations occurred through the late 1970’s (Jennings and Hayes 1994). Any remaining populations in Mexico are protected by Mexican law under the “Special Protection” category (Santos-Barrera et al. 2004). While there are no recognized subspecies of foothill yellow-legged frogs, recent genetic studies indicate that there is a genetic break along the transverse mountains (Lind et al. 2011). Although there are numerous occupied streams, only 30 of the 213 known populations in California have populations of at least 20 individual adults. These frogs are most numerous in the northern coast range with six populations of at least 100 adults and an additional nine populations of at least 50 adults (Fellers 2005).

Foothill yellow-legged frogs are found in partially shaded rocky streams in a variety of habitats including: valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral and wet meadows and appear to be highly dependent on free water for all life stages (Morey 2000).

The habitat characteristics of non-breeding adult foothill yellow-legged frogs have not been fully evaluated. Leidy et al. (2009) observed a group of six adults aggregated on a vertical ledge over a meter away from water in late summer. These animals were easily approached and did not respond to touch. This suggests that foothill yellow-legged frogs become inactive during late summer and autumn. The location of this aggregation also indicates that adults may migrate up tributaries consisting of large-sized boulders and bedrock to utilize the cooler air and water temperatures, and to avoid predators and high water flows (Leidy et al. 2009). Overwintering behavior is completely unknown, but adults are commonly found in tributaries prior to being found in the mainstem waterway. They are rarely seen more than a few meters away from water, but it remains unknown if they utilize upland areas during winter months (Kupferberg 1996). Habitat use of juvenile frogs is also largely unknown. Some evidence indicates that they potentially use smaller waterways such has springs or small tributary streams (Lind et al. 2011).

Breeding habitat is typically classified as a stream with riffles containing cobble-sized or larger rocks as substrate (Morey 2000). These streams are further defined by having low-water velocities near tributary confluences in shallow reaches and are wider and shallower than non-breeding sites, have emergent rocks and are typically asymmetrical with cobble or small boulder bars (Wheeler and Welsh 2008; Kupferberg 1996). Egg attachment sites are usually cobbles or boulders, but frogs may sometimes utilize bedrock or vegetation. These sites are often on the lee side of rocks or beneath overhangs such that the site has a narrow range of low-water velocity. Coarse sediment enables frogs to choose the best oviposition site to shield egg masses from high-flows. The reproductive strategy of the foothill yellow-legged frog is well suited to rivers with predictable winter flooding and summer droughts (Kupferberg 1996).

Wheeler and Welsh (2008) found that approximately 68% of adult male foothill yellow-legged frogs in their study were site faithful. These animals had an average breeding home range of 0.58 square meters (0.0001 acres) and home range size was directly linked with the frequency of aggressive behavior and calling activity. Males were not actively guarding future oviposition sites, but were guarding a specific, but generalized, patch of habitat within the breeding site (Wheeler and Welsh 2008).

Larval foothill yellow-legged frogs primarily consume algae and will preferentially graze on epiphytic diatoms as this food item allows them to grow more rapidly (Jennings and Hayes 1994). Post-metamorphs likely consume both aquatic and terrestrial insects but there is little research on the subject (Jennings and Hayes 1994). Adult diet is thought to include: flies, moths, hornets, ants, beetles, grasshoppers, water striders and snails with a terrestrial arthropod composition of 87.5% insects and 12.6% arachnids (Fellers 2005).

Breeding can occur as early as April 7th but may start as late as May 8th and typically continues at least a month with an average duration of 49.5 days between first and last egg depositions (Wheeler and Welsh 2008; Kupferberg 1996). Breeding occurs earlier in low-base flow years and begins when stream flow is at or below 0.6 meters/second and between 0.04 and 0.17 meters/second at the microhabitat scale (Wheeler and Welsh 2008). Eggs are typically laid in shallow areas ranging from 4 to 43 centimeters at varying distances from shore. When base-flow is low frogs will oviposit further from shore (Kupferberg 1996; Lind et al. 1996). Prior to egg deposition but while in amplexus, females will scrape potential attachment sites with their hind-feet in order to remove any debris and make egg adhesion stronger. This reduces the likelihood of the clutch being detached by a change in water velocity (Rombough and Hayes 2005). Females lay a single annual clutch of between 300 and 2,000 eggs (Jennings and Hayes 1994; Kupferberg 1996). Reproductive output is typically 18.8 +/- 1.9 clutches per breeding site (Kupferberg 1996). The critical thermal maximum for embryos is approximately 26 Celsius, however eggs are typically found from 9 to 21.5 Celsius (Jennings and Hayes 1994; Kupferberg 1996). Incubation lasts approximately two weeks (5 – 37 days) depending on water temperature and position within the clutch. Eggs near the attachment point and eggs in the center of the clutch typically hatch later than eggs on the periphery of the clutch (Kupferberg 1996; Fellers 2005). After hatching, tadpoles move away from the egg mass. As with egg development, larval development is temperature dependent with metamorphosis typically occurring 3-4 months after hatching with no documented overwintering of larvae. Foothill yellow-legged frogs metamorphose at a size of 1.4-1.7 centimeters (0.6-0.7 inches) in length. Reproductive maturity is thought to occur the second year after metamorphosis, but can occur as early as six months after metamorphosis. Longevity for this species is unknown (Fellers 2005).

High mortality in this species occurs during the egg and larval life stages. The main causes of mortality in eggs are hydrologic in nature. Eggs are usually killed by either desiccation or scour (Kupferberg 1996; Lind et al. 1996). Tadpole mortality can also occur as a result of irregular stream flows. The main critical velocity for tadpoles is 20 centimeters/second but flows as low as 10 centimeters/second can displace large tadpoles. This results in slower growth and development, greater exposure to predators and possible mortality. The seasonal pulses of high water flows used in many regulated rivers have a significant negative impact on recruitment for this species (Kupferberg et al. 2011).

Loss of genetic diversity due to habitat loss is a major threat to foothill yellow-legged frogs. Populations which are more than 10 kilometers apart are prone to genetic drift and barriers such as dams or habitat fragmentation may prevent dispersal between isolated populations (Dever 2007). In one study area, 94% of downstream bar habitat and potential breeding habitat was lost after the installation of a dam. The encroachment of riparian vegetation created stable sandy berms which caused the river to become narrower and deeper and thus unsuitable for use by foothill yellow-legged frogs (Lind et al. 1996).

Pesticides can impact these frogs in both original and derived forms. Chloroxon (the oxon derivative of chlorpyrifos) killed all tadpoles exposed to it in Sparling and Fellers (2007) study and was at least 100 times more lethal than the parent chemical. Air-borne pesticides are implicated as the most significant threat to this species, especially for Sierra Nevada populations which are directly impacted by pesticide drift from the central valley (Fellers 2005).

Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) in particular readily consume both larvae and adult frogs and are capable of directly affecting populations of foothill yellow-legged frogs. As foothill yellow-legged frog larvae are unable to avoid predation by novel predators, populations are prone to localized extinction when new predators are introduced into the system (Paoletti et al. 2011). Additionally, predation or competition with introduced American bullfrogs (*Rana catesbiana*) likely impact this species (Fellers 2005). Native garter snakes (*Thamnophis* spp.) feed heavily on all life stages of this frog (Morey and Papenfuss 2000).

Parasites pose an additional threat to foothill yellow-legged frogs. The parasite, Ribeiroia has been shown to cause severe limb deformities in other frog species and has been found in the vicinity of foothill yellow-legged frogs. Another parasite, Anchor Worm (*Lernaea cyprinacea*), is non-native and typically infects fish but can infect larval foothill yellow-legged frogs which can cause deformities or mortality. During periods of warm water, declining discharge and high host density infestation rates are high and outbreaks can occur. However, limb malformation occurs in less than 25% of infected individuals and if animals are infected after leg development, little to no deformation is observed (Kupferberg et al. 2009). Perhaps the most significant parasite that impacts this species is *Batrachochytrium dendrobatidis* which causes amphibian chytridomycosis. This parasite has been found in this species and has had significant impacts to the similar mountain yellow-legged frog (*Rana sierrae/Rana muscosa*) and other amphibian species worldwide (Fellers 2005).

In the Tahoe National Forest, foothill yellow-legged frog surveys were conducted in cooperation with the USGS Biological Division, Point Reyes from 1997 through 2000. In addition, California Academy of Sciences, San Francisco, has conducted herpetological surveys including areas likely to provide habitat for mountain yellow-legged frogs (1997, 1998, and 1999). Amphibian occurrence is also documented during fish stream surveys and incidental to various other field activities and surveys. Although species-specific surveys for foothill yellow-legged frog are limited on the forest, this species tends to be easily observed during stream surveys and sightings are recorded.

In 2008, Placer County Water Agency submitted a Special-status Amphibians and Aquatic Reptiles Technical Study Report as part of the Middle Fork American River Project (FERC Project No. 2079) (PCWA 2008). Foothill yellow-legged frog surveys were conducted at 46 sites in the treatment units and one reference location at the North Fork American River in 2007, by consultants for Placer County Water Agency. Individual frogs of different life stages were found in the mainstem and tributaries of the Middle Fork American River, North Fork American River and the North Fork Middle Fork American River.

Perennial streams or intermittent streams with perennial pools and ponds below 6,000 feet in elevation on the west slope of the Sierra Nevada are considered suitable for foothill yellow-legged frogs. Table 15 below summarizes the area (in miles and/or acres) of potential suitable habitat for this species within the Sunny South project area.

Table 15. Suitable foothill yellow-legged frog habitat in the Sunny South project area, by subwatershed and drainage.

12-Digit HU Subwatershed	Total Miles of Stream within Project Area (FYLF)			
	Intermittent (miles)	Perennial (miles)	Lake/ Spring Acres	Total Miles
Lower North Shirttail Canyon	4.30	2.70	0	7.0
Peavine Creek-North Fork Middle Fork American River	0	0.42	0	0.42
Upper North Shirttail Canyon	3.98	42.3	222	46.28
Upper Shirttail Canyon	1.28	1.12	0	2.40
Volcano Canyon-Middle Fork American River	0	1.74	0	1.74
Total	***9.56***	***48.28***	***222***	***57.84***

Foothill yellow-legged frog distribution in proximity to the Sunny South Project

There is one detection of foothill yellow-legged frog (FYLF) within the Sunny South project units and 19 within the 1.5 mile radius cumulative effects analysis area. The one detection within the project area is in unit SP-14 (an underburn only unit) and is from 1993. The other 18 detections occur outside the units and range from 1992-2001. Since there is a lack of amphibian surveys in the project area Management Requirements were developed under the assumption that all potential suitable habitats may be occupied by FYLFs.

Potential habitat for FYLFs has been identified throughout the project area in perennial and intermittent streams and water bodies below 6,000 foot elevation; however, these streams are not known to be occupied. Within the project there is a total of 48.28 miles of perennial stream channels that could be used for potential FYLF habitat. In addition there are miles of seasonal stream habitat that could be used for dispersal and migration corridors. There is also approximately 222 acres of waterbodies and springs with habitat for FYLFs. The Sunny South project is located at approximately 4,000 to 4,300 feet in elevation, which is well below the upper elevation limit (6,000 feet) for FYLFs. Table 16 below summarizes the total acres of RCA habitat for FYLFs within the Sunny South project area.

Table 16. Suitable foothill yellow-legged frog habitat in RCA and riparian buffer.

Sunny South Project	RCA (acres)		Riparian Buffer (acres)	
	Perennial	Intermittent	Perennial	Intermittent
Project Boundary	17.3	9.6	87.4	18.9
FYLF Potential Suitable Habitat	17.3	9.6	87.4	18.9

B. Effects

The analysis area for the FYLF includes all intermittent and perennial streams and water bodies within subwatersheds and basins inside the project boundary. One occurrence of FYLF is within unit SP-14. The detection is in close proximity to a road but also within the riparian buffer and therefore is not within an area that would be treated. The spatial extent of the analysis area for foothill yellow-legged frog (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities, which would occur under the proposed action, in correlation with the spatial extent of foothill yellow-legged frog home ranges. Further, the analysis area was delineated to encompass habitat that foothill yellow-legged frogs might use, but not so large as to potentially mask effects on foothill yellow-legged frog habitat from the Sunny South Project.

Direct and Indirect Effects

There would be a negligible risk of direct effects upon FYLFs, or their habitat, resulting from activities proposed. There are three potential scenarios in which FYLFs could be directly affected by project activities. These scenarios include 1) frogs coming into direct contact with mechanical equipment, 2) tree falling upon individual frogs, and 3) exposure and subsequent sickening of FYLFs from borate compound used to treat live cut stumps of conifers.

Research has shown FYLFs to be highly associated with water (Pope and Matthews, 2001; Pope and Larson, 2010). Movement over land and away from water is most likely to occur when FYLFs are in search of potential breeding sites during warm periods in early spring, often when there is still snow on the ground and the soil is wet (Pope and Matthews, 2001; Pope and Larson, 2010). When soil conditions become dry, individual frog movement is typically restricted to stream courses and/or wetlands. No mechanical equipment is permitted within 300 feet of perennial streams or wet meadows in subwatersheds considered to have potentially suitable habitat for FYLFs unless agreed to by a riparian specialist. In addition, the Sunny South project would not be implemented until soils were considered dry enough for project activities (TNF Wet Weather Operation Guidelines). Since project activities would not occur during wet soil conditions when FYLFs are most likely to be traveling overland, there would be no risk of mechanical equipment coming into contact with individual frogs.

The use of borate compound (otherwise known as borax) is proposed for cut stumps of live conifers greater than 14 inches diameter within hazard tree and area salvage treatment units (See Management Requirements). Although no research has been conducted to assess the effects of borax upon FYLFs, a study using larval leopard frogs (*Rana pipiens*) found borax toxicity is relatively low (SERA, 2006). Studies of borax toxicity upon other aquatic organisms deemed borax to be “practically non-toxic” (Information Ventures, Inc., 2003). Although borax toxicity is considered to be low, mitigations would still be in place to prevent borax from entering watercourses and potentially affecting aquatic habitats. Application of borate compound in the Sunny South project be directly applied to stumps within 25 feet of perennial or intermittent streams, meadows, and special aquatic features. Application of borax will also cease if there is sustained rainfall, to avoid misapplication and runoff. Given the above information on the toxicity of borax and mitigation measures, the application of borate compound to live cut stumps within the project area would have a negligible risk of affecting FYLFs, or their potentially suitable habitat.

Summary of Direct Effects

In summary, implementation of the Sunny South Project would have low risk of directly affecting FYLF due to limited mechanical equipment or felling of trees in riparian areas, and a negligible risk of poisoning by the use of borate compound.

Indirect Effects

Implementation of the Sunny South project would pose a negligible to low risk of indirect effects upon FYLF individuals, or their potentially suitable habitat. Limited ground-based mechanical treatments would occur within RCAs of subwatersheds considered to have potentially suitable habitat for FYLF. Management requirements would be implemented within upland (non-RCA) ground-based mechanical equipment units that would minimize sediment production and transport to adjacent stream channels. Since very little ground disturbance would occur within RCAs, these RCAs would also act as buffers to aid in filtering out any sediment that is potentially produced in upland treatment areas before it could reach stream channels. The felling of hazard trees would have a negligible impact upon water temperatures within perennial and seasonal streams, as only 4 percent of the total available RCA habitat would be treated.

FYLF habitat is expected to remain suitable (i.e. water quality and riparian habitat would be improved and minimum in-stream flows would be maintained). An estimated 66.8 acres within 300 feet of habitat distributed across the project area may be affected. Tree thinning would result in slightly warmer and drier conditions between 100-300 feet of perennial streams and 50-300 feet of intermittent streams and slightly reduce habitat suitability for FYLF dispersal in these areas primarily over the short term. Underburning fires that back into riparian areas would be slightly detrimental to habitat suitability over the short term, but slightly beneficial over the long term. The potential risk of adverse effects from a high severity wildland fire would be reduced, especially in the short term.

Pile burning would also follow RCA guidelines (e.g. no burn piles permitted within 100 feet of a perennial water sources and is expected to result in patchy increases in soil hydrophobicity and potential nutrient transport in portions of RCAs in the short term. However, because of the spatial buffers between burn piles and aquatic habitats effects to habitat suitability (e.g. water quality) are expected to be negligible in the short and long term. Prescribed burning is not expected to affect suitable habitats in the short or long term with the exception of where prescribed fire backs into riparian zones and results in long term increases in riparian and herbaceous ground cover and concomitant slight increases in water quality and stream shading. Mastication and chipping (removed for biomass or spread on site) are expected to have a negligible effect (e.g. to water quality or quantity) to suitable habitats. Hand cutting and/or lop and scatter activities are also expected to have a negligible effect (e.g. to soil and/or nutrient transport) on suitable habitats. In summary, the effects of proposed vegetation management activities to suitable habitats are expected to be negligible to slightly positive over the short and long term overall.

Changes in the permanent transportation system are expected to be slightly beneficial overall to aquatic habitats over the long term. Decommissioning an estimated 8.49 miles of non-system roads is expected to result in slight benefits as anthropogenic impacts (e.g. vehicle traffic) in these areas would be reduced and habitat quality would improve (e.g. reduced effects to soils and increased vegetative cover). New skid trails, temporary roads (estimated 2.5 miles of new temporary roads and 4 miles of temporary roads reconstructed on the existing road prism), and landings would not be constructed within RCAs (unless an alternative does not exist); effects to aquatic habitats are not expected because of the distances between new skid trails, roads, and landings and perennial and intermittent aquatic habitats, and Sunny South Project RCA guidelines (e.g. restrictions on the timing, locations, and types of equipment that may be used).

Fine scale habitat fragmentation is not expected to result from implementation of the proposed action for this species. The construction of temporary roads and landings is expected to result in a negligible effect to the foothill yellow-legged frog. Coarse scale habitat fragmentation is not expected to be affected by the proposed action as the quantities of high and moderate capability reproductive, resting, and foraging habitats would not change. Connectivity between large tracts of suitable habitats would be retained under the action or no action alternative. Habitat connectivity at the landscape scale is expected to be preserved at a level equivalent to the existing condition. Risk of coarse scale fragmentation from wildland fire (e.g. the 2013 American Fire) or large scale pathogen-induced stand mortality would be reduced in treatment areas. Also, given climate change as described above for all species, no new barriers to foothill yellow-legged frog movement or distribution are expected to be created by the implementation of the proposed action alternative.

Summary of Indirect Effects

The two risks associated with project activities which may indirectly affect FYLF or their potentially suitable habitat include 1) increased sedimentation of potentially suitable habitat as a result of ground disturbance, and 2) reductions in canopy cover within potentially suitable habitat as a result of tree felling within RCAs, which could lead to increased water temperatures. It has been determined that activities proposed would have a negligible to low risk of sedimentation of stream channel and off-channel habitat, and a negligible risk to changes in canopy cover.

Although analysis of effects is focused upon treatments within RCAs that are hydrologically linked to potentially suitable habitats, proposed vegetation management activities outside of RCAs have the potential for exposing bare mineral soil and destabilizing hill slopes. These effects can, in turn, result in increased sedimentation of stream channels located downhill from upland treatments. Descriptions of RCA-specific management requirements can be found in the Management Requirements section of this document. In general, RCA-specific MMR's were designed to minimize ground-disturbing actions within RCAs while meeting project objectives.

Cumulative Effects

As described above, the spatial extent of the analysis area for FYLF (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities. The analysis area is temporally defined to extend 20 years before and after the present; in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 3,079 acres.

Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (1,829 acres) and seed tree cut (555 acres) may have caused warming within RCA habitat by removing canopy cover. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 50 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable FYLF habitat that was burned at high severity it is likely that most was rendered unsuitable. Hazard tree removal has likely occurred along roads and in recreation areas. Removing a minimal number of hazard trees is not expected to reduce overall canopy cover or tree size class and therefore would maintain habitat suitability but slightly reduce habitat. Non-public lands account for 9,879 acres or 26% of the analysis area. Private timber harvests and fire salvage likely caused a warming of RCA habitat due to less shade.

Private land accounts for 9,879 acres or 26% of the analysis area. Private timber harvests and fire salvage likely caused a warming of RCA habitat due to less shade.

The effects of past actions can best be quantified by discussing what is present today. Although past actions on forest land are expected to have reduced habitat quality for the short term, overall flowering plant availability is expected to have increased through the reduction in forest canopy cover mostly as a result of high severity wildfire.

Past actions have had slightly beneficial to slightly detrimental effects to potentially suitable habitat in the analysis area. With the possible exception of wildland fire suppression, current actions are not expected to affect potentially suitable FYLF habitat. Reasonably foreseeable future actions are not expected to affect or are expected to result in effects similar to the proposed action. Wildland fire suppression has permitted fuels to accumulate and the threat of detrimental effects to non-breeding habitat from a potential high severity wildland fire to persist. The proposed action is expected to result in slight warming and drying of approximately 66.8 acres within 100-300 feet of perennial streams or 50-300 feet of intermittent streams from thinning. Prescribed burning (i.e. fire backing into riparian habitat) would occur on the majority of thinned acres under both alternative and would result in slightly detrimental effects in the short term and slightly beneficial effects over the long term. Habitat would remain suitable under the action alternative. The risk of detrimental effects to habitat from high severity wildland fire would be reduced under the proposed action. Cumulative effects from past, present, and reasonably foreseeable future projects to suitable habitat are the increased drying and warming of approximately 66.8 acres that have been thinned and burned (acres overlap) and reduced risk of severe wildfires on all treated acres.

C. Conclusion and Determination

It is my determination that the Sunny South Insect Treatment Project **may affect individuals, but is not likely to result in a trend** toward federal listing or loss of viability for the foothill yellow-legged frog.

> Rationale: There is a very low chance of disturbance to individual foothill yellow-legged frogs during project implementation; habitat suitability would remain the same and adverse cumulative effects would not occur.

BLACK JUGA

Status: USFS R5 Sensitive

A. Existing Environment

NatureServe (http://www.natureserve.org/explorer/, updated January, 2000) reports the conservation status of *Juga nigrina* (Lea 1856) as vulnerable (G3). Taylor (1981) listed one synonym, *Melania californica* (Clessin 1882) for *Juga nigrina*. He described the species as commonly occurring in tributaries of the Sacramento River and interior drainages of northeastern California, locally in the upper Klamath River, the uppermost Eel River drainage, the Napa River and coastal streams of Mendocino County (Big and Noyo rivers) and south into the Russian River drainage of Sonoma County with the southern-most population in Salmon Creek of Sonoma County apparently extirpated. Historically, black juga was described as occurring in headwater streams and river tributaries from northwestern California to southwestern Oregon (Henderson 1929, Burch 1989). However, the genetic sequence attributed to *J. nigrina* from the Umpqua basin in Oregon by Holznagel and Lydeard (2000), was found by Campbell et al. (2010) to be more closely related to specimens of *J. silicula* from the Willamette River. The family Pleuroceridae, to which this species belongs, is currently the most diverse in North America with about 1,000 nominal and 200 valid species (Strong et al. 2008). Three related species, *Juga acutifilosa*, *chacei*,and *occata*, are also Pacific Southwest Region Sensitive Species.

Recent analyses (Campbell et al. 2010) based on anatomy and genetics established that this species, as recognized in museum collections and literature, is composite. According to Frest & Johannes (1995), *Juga nigrina* occurs in the upper Sacramento, McCloud and Pit river systems. They reported collecting this species from 31 of 231 sites surveyed in the upper Sacramento and Pit river systems and concluded that the species had been extirpated from a "fair number" of historic sites in tributaries to the upper Sacramento River. Black juga, as presently understood taxonomically, is restricted to the upper Sacramento system in California. The type-locality populations in Clear Creek, Shasta County, tributary to the Sacramento River, have been decimated by gold mining activities (Frest and Johannes 1995), but the species still persists in Clear Creek above the town of French Gulch, the epicenter for the mining operations (Johannes 2010). This species only occurs in California.

Frest & Johannes (1995) report that this species has been extirpated from most of its type locality of Clear Creek, tributary to the upper Sacramento River, due to gold mining. The authors further concluded that this species has been extirpated from several sites based on the apparent absence of this species at many historic sites in the upper Sacramento River system (Frest & Johannes 1995, See Table 10 for a list of museum records.)

Threats to spring and stream habitats occupied by *Juga nigrina* include:

- Excessive sedimentation from a variety of activities such as mining, logging, road and railroad grade construction, and grazing may smother substrates and stress or kill individuals, and impair egg-laying or survivorship of eggs or young.
- Livestock trampling and grazing of small streams, springs and spring runs resulting in reduced dissolved oxygen levels, or elevated fine sediments and water temperature.
- Water diversions resulting in reduced spring or stream flow, elevated water temperatures, fine sediment accumulations, lower dissolved oxygen and thus less suitable habitat.
- Dam construction, which inundates cold springs, slows current velocities, lowers the availability of oxygen and allows fine sediments to accumulate.
- Excessive sedimentation from a variety of activities such as logging, mining, road and railroad grade construction, and grazing may smother substrates and stress or kill individuals, and impair egg-laying or survivorship of eggs or young.

Black juga utilize perennially flowing streams and rivers as habitat. At present, all perennial streams within the Sunny South project area are considered potentially suitable habitat for black juga. There are approximately 17.32 miles of potentially suitable habitat for black juga within the Sunny South project area.

The nearest known existing population of black juga is within South Yuba River, Washington Creek and East Fork Creek located outside of the project area. However, no project activities described under the Sunny South project would occur within the South Yuba subwatershed. Since no mollusk surveys have been conducted within other perennial streams within the project area, it is assumed that the black juga may occupy these habitats. There would be no risk of direct effects upon the black juga through contact with mechanical equipment because no project activities would occur within their potentially suitable habitat (perennial streams).

B. Effects

Direct and indirect effects to the black juga may occur as a result of the proposed action. Mechanical thinning can increase sedimentation into stream channels that stress or kill individuals, and impair egg-laying or survivorship of eggs or young. Under the proposed action 2,737 acres fuels treatments (e.g. mastication, prescribed burning, or machine piling). Habitat availability across the analysis area would be minimally affected by either proposed action as at least 50% soil cover would be left post project implementation. By leaving soil cover over at least half of the treated project units, input from sedimentation should be limited over much of that area. No long term reduction in suitable habitat would occur as a result of the action alternative.

Direct Effects

Implementation of the Sunny South project would have no risk of directly affecting black juga through contact with mechanical equipment because no project activities would occur within suitable habitat for this species.

Indirect Effects

The two risks associated with project activities which may indirectly affect the black juga or suitable habitat include 1) increased sedimentation of potentially suitable habitat as a result of ground disturbance, and 2) reductions in canopy cover within potentially suitable habitat as a result of tree felling within RCAs, which could lead to increased water temperatures. It has been determined that activities proposed would have a negligible to low risk of sedimentation of perennial stream channels, and a negligible risk to changes in canopy cover.

Although analysis of effects is focused upon treatments within RCAs that are hydrologically linked to potentially suitable habitats, proposed vegetation management activities outside of RCAs have the potential for exposing bare mineral soil and destabilizing hillslopes. These effects can, in turn, result in increased sedimentation of stream channels located downhill from upland treatments.

With implementation of the project management requirements and BMPs discussed above, there would be nominal indirect effects to the black juga and its potential habitat within the Sunny South project by the proposed actions.

Management requirements for the Sunny South project were developed under the assumption that all potential suitable habitats may be occupied by black juga. Descriptions of RCA-specific management requirements can be found in the Management Requirements section of this document. In general, RCA-specific MMR's were designed to minimize ground-disturbing actions within RCAs while meeting project objectives.

Ground-disturbing activities within RCAs are the most likely actions to produce sediment which could enter perennial waters and thus affect black juga, or their potentially suitable habitat. Project activities taking place in upland (non-RCA) habitat may also contribute sediment to perennial waters. Mechanical treatments would occur outside of RCAs. Hazard tree removal would occur by hand. Since hand treatments produce very little ground disturbance, emphasis of analysis in upland (non-RCA) areas is focused on the use of ground-based mechanical equipment.

The type of equipment being used is another consideration when assessing potential ground disturbance by mechanical equipment operation. As previously mentioned, mastication treatments produce large amounts of groundcover as they break down brush and small trees, often leaving more groundcover after treatment than was present prior to treatment. One would expect very little soil erosion resulting from mastication. Table 17 below indicates that minimal ground disturbance would occur within RCAs, these RCAs and riparian buffers would also act as buffers to aid in filtering out any sediment that is potentially produced in upland treatment areas before it could reach stream channels. Project activities would have a negligible to low risk of sedimentation of potentially suitable habitat for black juga.

Table 17. Proposed vegetation treatments within 300 feet of black juga habitat.

Subwatershed	Total Acres of RCA within Sunny South Project Boundary	Acres of Riparian Conservation Area Proposed for Treatment	
		Perennial/Intermittent	
		Whole Tree Yarding and Underburn	Underburn Only
Peavine Creek-North Fork Middle Fork American River	98.02	98.02	0.0
Upper Shirttail Canyon	1,016.95	973.51	43.44
Volcano Canyon-Middle Fork American River	114.59	114.59	0.0
TOTAL	***1,229.56***	***1,186.12***	***43.44***

Summary of Indirect Effects

In summary, implementation of the Sunny South project would pose a negligible to low risk of indirect effects upon black juga individuals, or their potentially suitable habitat. Since very little ground disturbance would occur within RCAs, these RCAs and riparian buffers would also act as buffers to aid in filtering out any sediment that is potentially produced in upland treatment areas before it could reach stream channels. In addition implementation of this project is expected to have a negligible effect upon water temperatures in project-area subwatersheds.

Cumulative Effects

As described above, the spatial extent of the analysis area for black juga (38,189 acres) extends 1.5 miles beyond the maximum spatial extent of proposed project activities. The analysis area is temporally defined to extend 20 years before and after the present; in correlation with the estimated longevity of vegetation treatments.

Specific past, present, and reasonably future actions within the analysis area are summarized in the General Cumulative Effects summary in this document. Based on GIS analysis using the Forest Service FACTS database, within the past 20 years vegetation management actions on National Forest System (NFS lands) within the analysis area have been completed on a total footprint of approximately 3,079 acres.

Of the past projects that have occurred on forest land within the analysis area, treatments such as commercial thinning (1,829 acres) and seed tree cut (555 acres) may have caused warming within RCA habitat by removing canopy cover. Wildfires have occurred over approximately 3,629 acres or 10% of the analysis area over the last 50 years. Of the area that burned, it is estimated that 60 acres experienced high severity fire. Of the suitable black juga habitat that was burned at high severity it is likely that most was rendered unsuitable. Hazard tree removal has likely occurred along roads and in recreation areas. Removing a minimal number of hazard trees is not expected to reduce overall canopy cover or tree size class and therefore would maintain habitat suitability but slightly reduce habitat. Non-public lands account for 9,879 acres or 26% of the analysis area. Private timber harvests and fire salvage likely caused a warming of RCA habitat due to less shade.

Private land accounts for 9,879 acres or 26% of the analysis area. Private timber harvests and fire salvage likely caused a warming of RCA habitat due to less shade.

Past, present and reasonably foreseeable future actions are expected to have a negative effect to black juga habitat. Due to the temporary nature of the negative effects and due to the projects not all occurring within the same timeframe it is expected that some areas would have recovered therefore the slight reduction of habitat suitability would not occur concurrently and effected area would be limited. Past actions that have temporarily reduced habitat suitability are expected to have recovered and will therefore not contribute to cumulative effects. The short term negative effects of past, present, and reasonably foreseeable future actions would not contribute to adverse cumulative effects.

C. Conclusion and Determinations

After considering known life history requirements, current conditions, historical and current survey information, and integrated management requirements, it is my determination that implementation of the Sunny South Insect Treatment Project **may affect individuals but is not likely to result in a trend** toward Federal listing or loss of viability of the black juga.

Rationale:

- No project activities would occur within potentially suitable habitat for the black juga.
- There would be a negligible to low risk of indirect effects upon the black juga, or their potentially suitable habitat, due to the following:
    a. Implementation of Soil Quality Standards and appropriate BMPs would minimize the risk of soil erosion within upland (non-RCA) treatment units.
    b. The restriction of ground-based mechanical equipment from RCAs would provide a buffer between upland treatment units and potentially suitable habitat for black juga, in that sediment would be filtered out in the RCA before it could enter stream channels.

VII. LITERATURE CITED AND REFERENCES

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Pacific Fisher, Pacific marten, California Wolverine

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